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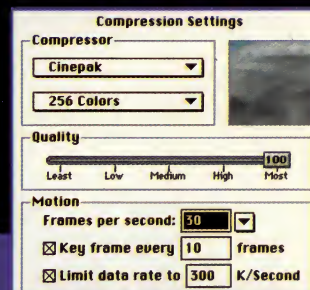
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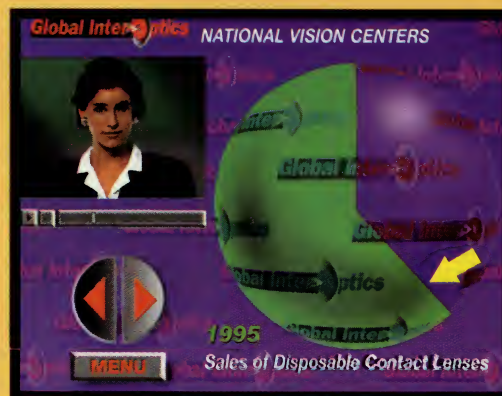
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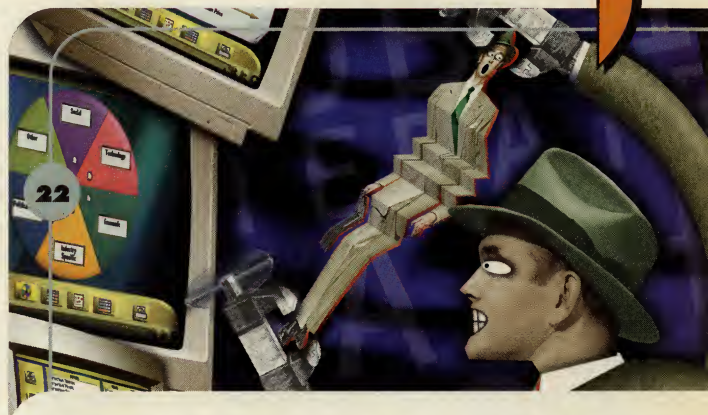
DeBabelizer sports an interface that some believe to have been designed by highly intelligent aliens. It is also the most powerful graphics utility known to humankind. This tutorial will teach you to get a great deal more out of this indispensable multimedia development tool.

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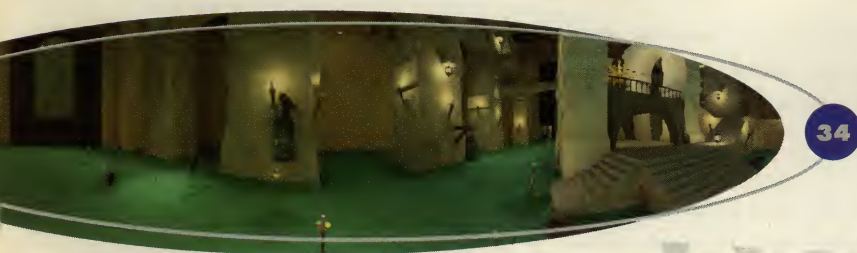
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Useful contact numbers.





UGLY PROSPECTS

Time for another heinous episode of *Truth is Stranger than Fiction*, the Internet Edition. Join us as elected officials protect truth, justice, and the paranoid way by moving to ban "indecent" material on the Infobahn. Marvel at Germany's brave police officers as they storm the CompuServe offices, forcing them to shut down access to Internet news-groups lest the sexual materials there violate German anti-porn laws.

During our first commercial break, hear sex kittens remind you that while visiting Deutschland, you can visit Dr. Mueller's Sex Shoppe featuring the latest in adult entertainment products in the beautiful Frankfurt airport. And while tuning in to TV in the evening, channel surf the latest Italian game shows, where men and women play variations on strip poker for your primetime viewing pleasure. Or check out French TV for the best in uncut dubbed American XXX feature films showing from 9 p.m. on.

Upon rejoining our show, already in progress, learn that the crusade continues in the good ol' U.S. of A. with a Californian concerned about children being able to order cigarettes over the Net. "This is a horrible situation. There's no way to check an I.D. on the Internet. We need more government controls before this thing gets out of hand," Mr. Watchdog points out.

In other developments, discover the Telecommunications Bill is nearing a vote, complete with Senator Exon's amendment that would ban "indecent" material from being transmitted across the Internet. The report, covered by the big three TV news networks, is accompanied by pictures of *Bay Watch* babe Pam Anderson and various images from *Playboy's* Web site. Across America, people who've never touched a computer vow they will never let their kids go near the Internet, while said kids fire up those modems and go surfing for cheap thrills they didn't know were there.

When another word from our sponsors interrupts, you'll know to catch the next episode of *The Young and the Restless* tomorrow at sometime or other, when you'll see a bunch of scantily clad gorgeous women throw themselves at manly men with abs of steel in full view (oooh, ah). And on the next *Montel Jenny Geraldo Show*, crossdressing marsupial lovers confront their gay parents for the first time on a network that refuses to accept paid advertising for condoms.

As our show closes, view scenes from next week when you'll watch a mother investigated by police who received a tip from her local photo-developing shop that she might be a child pornographer because she had taken 100 shots of her baby son in the buff.

There's a lot more to these ugly prospects than you might think. Every one of the above ironies is real. It's natural to shrug your shoulders, giggle, and bury your head in the sand rather than get sucked into the maw of political activism. But our surveys indicate that at least half of you are developing for the Internet. Elected officials whose intentions may be good, bad, or otherwise are wrestling with issues that will affect what you can and can't do over the Net. Cyberactivist and *IA* contributing editor Bob Gelman offers suggestions on what you can do about it on page 96.

Enjoy.

Dominic Milano
Editor

InterActivity™

Vol. 2, No. 3 [Issue #8] March 1996

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InterActivity (ISSN 1077-8047) is published monthly by Miller Freeman, Inc., 600 Harrison St., San Francisco, CA 94107. Telephone (415) 905-2200; FAX (415) 905-2233; TELEX #278273. Application to mail at Second Class Postage Rate is pending at San Francisco, CA. Subscription rate for 1 year is \$59.95*. All subscription orders, inquiries, and address changes should be sent to Box 1174, Skokie, IL 60076. For fastest service, telephone toll-free, 1-800-467-7498; outside of the United States call 708-647-9158. Please allow 6-8 weeks for address change to take effect. **POSTMASTER:** Send address changes to **InterActivity**, Box 1174, Skokie, IL 60076. **InterActivity** is a trademark of Miller Freeman, Inc. All material published in **InterActivity** is copyrighted © 1996 by Miller Freeman, Inc. All rights reserved. Reproduction of material appearing in **InterActivity** is forbidden without written permission. Publisher assumes no responsibility for return of unsolicited manuscripts, photos, or artwork. *Canadian GST included—permit #124513540. BPA Membership Applied for.



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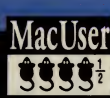
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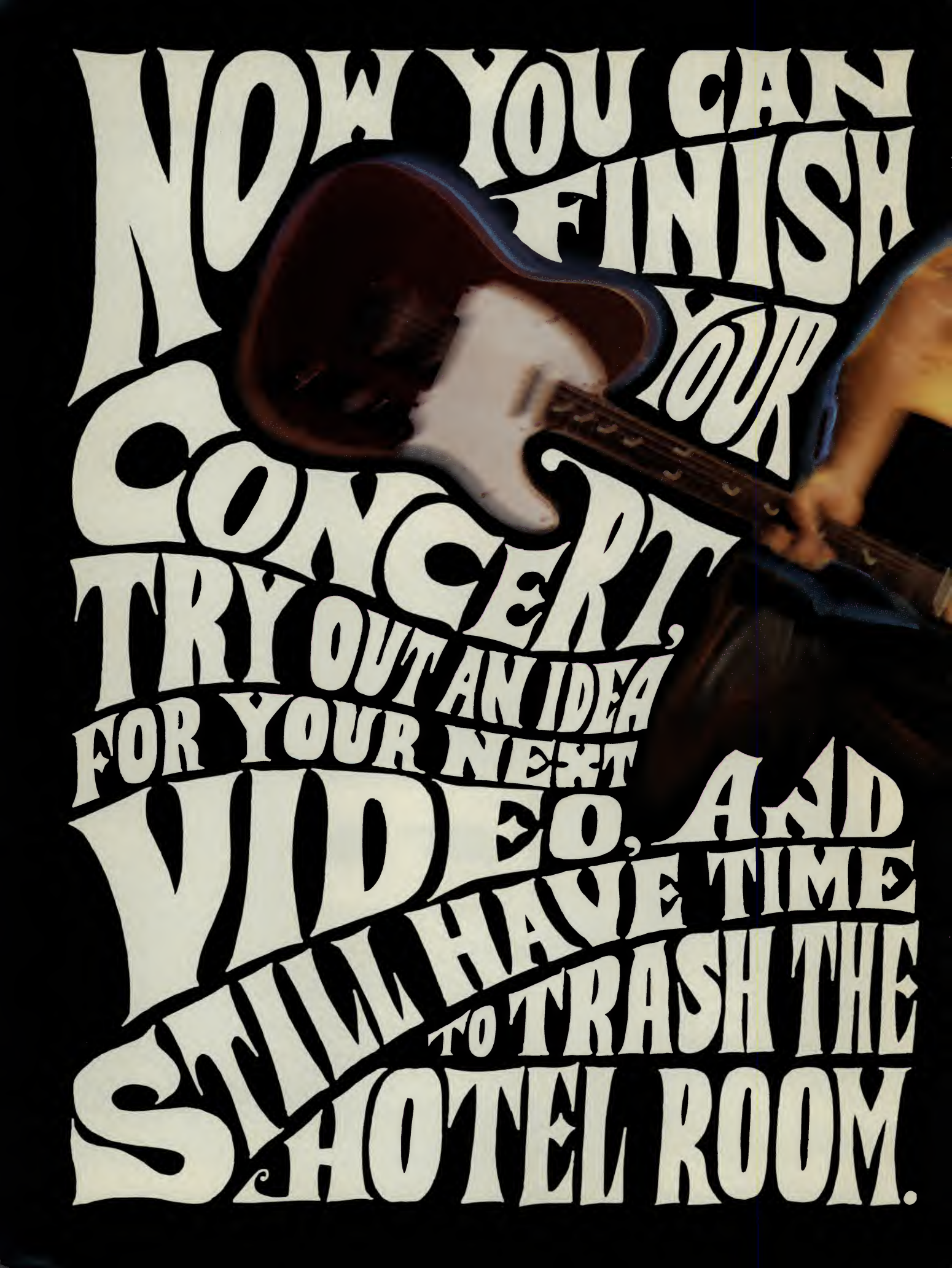
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MEDIA
100

READER SERVICE NO. 3

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WHAT DID YOU HAVE IN MIND?[™]

Q: *I want to register a domain name on the Internet. How do I go about doing it?*

A: The puzzling and misleading journey to get your very own domain name on the Internet leads you down a windy path to Hershon, Virginia, of all places. It's an easy, painless process assuming you're not some scam artist trying to register *mcDonalds.com*. The organization that oversees this process is called InterNIC, which comprises two companies: AT&T and Network Services Inc. (NSI). AT&T provides directory service, and NSI provides some information services and registration (address and fax number below). NSI assigns second-level domain names for the top-level Internet root domains (*com*, *org*, *net*, *edu*, and *gov*).

Fill out a simple application form and send \$100 for the first two years (it was free until a few months ago). They cross check your requested domain name (i.e., *smith.com*) against their database. Initially, as long as no one else has claimed the same name, it's yours. All you need to do to maintain a domain name is send a check for \$50 every year after the first two years.

The confusing part is, depending on your service provider you may or may not deal with InterNIC. Most likely you will deal directly with your service provider to get your name. The service provider will furnish the primary and secondary server information. Then they will forward the registration information to InterNIC. Some providers may request that you do this step, but most likely they will handle it. The payment will be billed directly to you or passed on by the service provider. The entire process, assuming no glitches or duplicate names occur, should take one or two days.

This procedure pertains only to the United States. If you are in Europe, you will register with RIPE Network Coordination Centre. In the Asian-Pacific region, you need to register with APNIC.

Since March 1993, the National Science Foundation has funded the administrative costs of assigning root domains through a cooperative agreement with NSI. InterNIC is the only group with the authority to assign names right now in North America. In the last year, they have experienced some growing pains. In July 1994, 18,000 names were registered. By July 1995, that number had reached 83,000.

Because of abuses of domain name registration, InterNIC has cracked down on people who are warehousing names, i.e., registering a name they know another company will want in hopes of selling it. InterNIC reserves the right to revoke

a domain name if the applicant fails to use it within 90 days of registration.

A new addition to the application form is an indemnification clause that establishes your liability for any legal expenses incurred by InterNIC should legal wrangling occur over the name you have chosen. If it is determined that you really didn't have the right to use the name, you'll be liable for legal expenses, both your own and InterNIC's.

- NSI, Registration Services, Box 1656, Hershon, VA 22070; vox 703.742.4777; fax 703.742.4811; Internet <http://www.internic.net/>

- RIPE, ncc@ripe.net

- APNIC at info@apnic.net



Q: *How can I create a custom palette?*

A: Most programs capable of manipulating color provide some variation on two basic ways to create a custom palette. Generally, you can either select the colors manually or derive them automatically from an existing image.

Be aware, however, that this is a huge topic that requires far more space than we can give it here. There are not-so-obvious variations in the ways various platforms handle color. For instance, Windows requires that a specific set of colors, arranged in a specific order, occupy the first and last 10 positions in any palette. Idiosyncrasies like this make the answer that follows

necessarily general — stay tuned for a feature story that tells you everything you need to know about crossplatform color.

That said, here's how to create custom palettes in Adobe Photoshop 3.0 (the procedures are the same on both Mac and Windows versions):

1.) To select colors manually, load an image and select INDEX COLOR... from Photoshop's MODE menu. (If INDEX COLOR... is already selected, select RGB COLOR and then reselect INDEX COLOR...) In the resulting dialog, click the CUSTOM... radio button under PALETTE and NONE under DITHER. Then dismiss the dialog by clicking OK. The COLOR TABLE dialog will appear with the current palette (most likely the one provided by the operating system) ready to be edited.

To alter any color in the table, click on it. The COLOR PICKER dialog will appear, enabling you to replace the original color with any color in the range currently displayed by your monitor. (This is determined by the number of colors you've selected in the appropriate control panel in your computer's operating system.) When you're happy with the color selection, click SAVE to save your custom palette and OK to return to your image. You can display the current palette for further editing at any time by selecting COLOR TABLE... from the MODE menu.

You can also load custom palettes from this dialog, enabling you to keep a selection of palettes on hand for specific applications, and to use specific palettes when working on specific projects.

2.) To derive a custom palette from an existing image, load the image and, again, select INDEX COLOR... from the MODE menu. In the dialog, click the radio button labeled 8 BITS/PIXEL (or whatever bit depth you want) under RESOLUTION. Under PALETTE, click the radio button marked ADAPTIVE. Dismiss the dialog by clicking OK. Now the MODE menu's COLOR TABLE... option will be enabled. Select it and you'll see your new custom palette. Of course, it too can be edited, saved, and reloaded as described above.

DeBabelizer, a powerful graphics application from Equilibrium, is capable of analyzing a group of images and creating a *super palette*, a single custom palette optimized for the group. That is, it contains the colors that appear most frequently throughout the various images. This is ideal for displaying QuickTime clips or any series of images that don't share a common palette. (The DeBabelizer power user's clinic in this issue describes how to accomplish this.)

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READER SERVICE NO. 4

R U N T I M E

Compiled by Erica Smith & Kathleen Maher

Rumor Has It

In an ongoing effort to dominate the market for multimedia peripherals, **Diamond** has developed a broad range of consumer products that includes graphics accelerators, sound boards, video boards, CD-ROM bundles, you name it. Now they're going after the professional market as well. The seriousness of their intent can be gauged by their acquisition of **Spea Software AG**, the largest manufacturer of graphics accelerators in Germany. Diamond purchased the privately held company for \$61.5 million in stock (2.2 million shares). Besides an entre into Europe, Diamond gains an innovative development arm with considerable expertise in highend graphics hardware. . . **Macromedia** just gobbled up **OSC**, a developer of software for audio production, with the goal of filling gaps in their audio line and creating highend solutions. **OSC** received 62,000 shares of Macromedia common stock for all shares of **OSC** at a value of approximately \$2.8 million. . . The **Interactive Multimedia Association** began a campaign to introduce CD Match, software that checks an end user's PC and spits out a systems capabilities checklist. In conjunction with the IMA's Uniform Label program, it enables consumers to easily figure out compatibility between titles and their systems, pushing down the number of returns and installation headaches and increasing customer satisfaction. . . **Electric Image** is shipping an educational version of their highend graphics application, dubbed the Scholastic Edition, for those who wish to be trained in 3D animation. The growth in this area has created new job opportunities. Any student with a valid student ID can buy it for \$795. . . **McGraw-Hill** is launching McGraw-Hill Home Interactive to create edutainment CD-ROMs. . . **Grolier Electronic Publishing**

Continued on Page 10

Downloading FOR DOLLARS

The mighty CompuServe has been bowed by a consortium of 140-odd music publishers in a two-year-old class action suit recently settled out of court. The settlement, in the amount of \$568,000 (subject to court approval as we go to press), stipulates that CompuServe charge users a fee each time they download a file containing copyrighted material.

The suit, brought by Frank Music (a publishing concern owned by Paul and Linda McCartney), alleged that CompuServe violated Frank's rights through the actions of an online subcontractor, MIDI Forum. MIDI Forum had been distributing arrangements of songs in the form of standard MIDI files without compensating composers, arrangers, performers, or copyright owners. Frank argued that because CompuServe receives fees from subscribers, money is collected that rightfully belongs to those who own the copyright to materials made available for downloading. CompuServe contended that it is a provider of services rather than products and thus, like a library or telephone company, is not responsible for the material that passes through the network.

Beyond the ambiguity of online providers' responsibilities to copyright owners, the suit raises issues of how current laws governing intellectual property — themselves ambiguous at best and clarified only through infrequent court precedents — relate to digital media. MIDI files present particular difficulties, since MIDI itself is code that might be generated in a number of ways, but with proper software can be transformed into a recorded performance, printed sheet music, and other tangible media products. For instance, does a MIDI file — a set of performance commands not unlike an electronic piano roll — represent a performance fixed in a tangible medium? If so, does transmission of a MIDI file require a performance right (payable to the performing rights licensing societies ASCAP, BMI, and CESAC)? Does downloadable audio material associated with images require a synchronization license (usually negotiated through the Harry Fox Agency)?

Because Frank v. CompuServe was not decided in court, no legal precedent has been set. Nonetheless, the settlement is likely to be regarded as a landmark, and its implications extend beyond the realm of music. At the very least, it suggests that those who operate online services must be aware of the copyright issues surrounding the material they deliver, and they must be proactive about ensuring that the most relevant permissions are granted and licenses paid. ❧

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When the first motion pictures were created more than 100 years ago, it raised audience expectations of what pictures on a wall could look like, and with each new technological advance (or rumor of one) those expectations have risen even more. Twenty years ago, people would line up around the block to catch a glimpse of the Super Bowl on the cool new projection TV at Joe's bar. These days, audiences of several hundred assemble routinely for PC-based multimedia presentations, but the complaints are still the same. For video projection to be the communication

Continued on page 10



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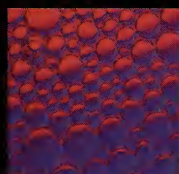
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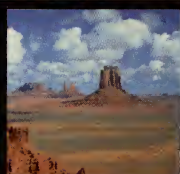
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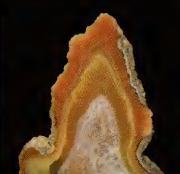
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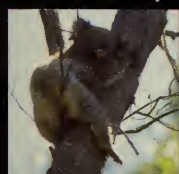


Agates, Crystals & Jaspers

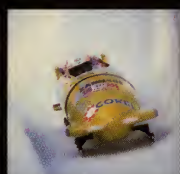


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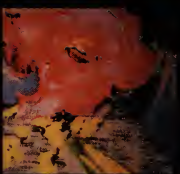
Classic Aircraft Illustrations



Women by Jack Cutler



Textures by Frank Scott



Contemporary Fabric



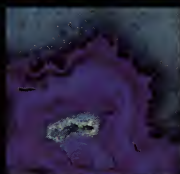
Abstracts & Patterns



Intimate Landscapes



Cards



Agates



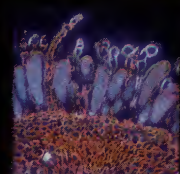
Marine Life



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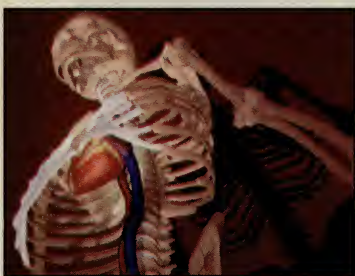
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Rumor Has It

is starting up a games division called 3 Prong Plug and has recently released its first two titles: *SFPD Homicide Case File* and *Terror T.R.A.X.* . . . **Engineering Animation, Inc. (EAI)** specializes in 3D computer visualization and is branching into the interactive market with its new **EAI Interactive** division. Focusing on



The Dynamic Human

creating multimedia titles in education, business training, and marketing, EAI has teamed up with companies such as **Times**

Mirror and **Time Warner**. Their first release is *The Dynamic Human: The 3D Visual Guide to Anatomy & Physiology*. . . . *Torin's Passage*, a title from **Sierra On-Line**, has just shipped and is chock full of 3D and 2D animation, beautiful hand drawn backgrounds, and an online hint book. Al Lowe is the designer and Academy Award-winning Michel Legrand composed the music. . . . The creators of *Tetris* have finished a new action game called *Ice & Fire*, a first-person, strategic flight navigation featuring 3D texture mapped environments and an artificial intelligence engine. . . . **Apple** hopes to bridge the gap from TV to Internet with Pippin. Originally designed as a multimedia player, it's looking more and more like a CRT monitor with Internet capabilities. Apple has already licensed the technology to **Bandai** in Japan, which plans to sell it with their own online service. Other companies, including **Oracle**, are promising to deliver similar systems, perhaps as soon as this month. . . . In the art-meets-technology department: **Softimage** premiered a virtual

Continued from Page 8

solution that everyone hopes for, it must be brighter, clearer, and easier to carry.

Recently Texas Instruments and Sony raised the stakes again when they joined to present a prototype high-definition projector for the next wave of presentation technology. The secret behind their projection system is a collection of tiny mirrors (approximately half a million of them), each 16 microns square, manufactured on a single silicon chip. It's called Digital Micromirror Device (DMD) and it's the heart of the newly developed Digital Light Processing (DLP) system from Texas Instruments.

Dave Leonnig of TI explains that the collaboration was a logical one. "TI wanted to show that we could fabricate a high definition chip, and Sony wanted to show that they could manufacture a high definition projector."

The Sony/TI projection system uses three 20mm x 35mm DMDs, composed of approximately 2.3 million mirrors, creating approximately 2.3 million closely spaced pixels that can be displayed with little or none of the screen door effect common to LCD projectors (with 1.3 to 1.5 million pixels). The DMD provides a reflective surface area of nearly 90% and an incident light reflectivity of 80%, resulting in a brightness capability five to 10 times that of standard CRT projectors. The Sony/TI projector provides more than 1,500 ANSI lumens from a 1,000-watt lamp.

While the Sony/TI collaboration may be the biggest news about DMD since it was first developed in 1989, it's certainly not the only news. The first quarter of '96 should be a hot time for DMD, with projectors expected from nVIEW, InFocus, and Proxima. Another TI partner, Rank Brimar of Manchester, England, is preparing to release their projector by late 1996. They became involved with TI in 1989 when, as Mike Blackburn of Rank Brimar describes it, "even in those days we could see the potential."

The DMD is only one component of DLP. Other components of the system, which TI expects to license to projector manufacturers as a single package, include a light source, optical projection lens, color filter system, and digital light processing electronics. The system comes in one, two, and three-chip configurations.

The DMD picture is created when current is applied to one of two electrodes attached to each individual mirror. This tilts the mirror either on (reflecting light toward the optics) or off (reflecting light away from the optics). "A basic principle behind DLP is that the eye does the processing," Leonnig explains. The pixelated image created by the reflected light is displayed simultaneously (in contrast to the scanned image of current CRT technology). Pulse-width modulation is used to alter the pixel display in each projected frame allowing for true digital video projection without the need for digital-to-analog conversion.

How does DMD look in a marketplace filled with new technologies? Landon Lovett of nView describes his company's expectations quite succinctly: "By the end of '96 you will see comparable resolution [to CRT projectors] in a better package and at a much better price point."

"The basic CRT has been around since the thirties and is due for some challenges," states Bill Schripsema of AmPro, manufacturers of both CRT and LCD projectors. While DMD is not the only new kid on the block, it has all the earmarks of being the main challenger in virtually every critical factor: brightness, resolution, versatility, and size.

Until now, the display needs of the end user dictated the type of projection technology. If you needed extremely sharp resolution but could sacrifice brightness, CRTs have been the way to go. If image size and brightness were the major issues, Reflective Light Valve solutions were the best option. If flexibility and portability were the key to taking your show on the road, the midprice compact LCDs were the products of choice. With DMD, the video projection market is evaluating a technology that just might capture all three major video projection arenas.

Tom Sutherland of American Video Communications describes DMD as potentially revolutionary. "LCDs expanded the market for projectors. People who would never have considered CRT projectors began using LCDs. DMD is a different technology that could change the market," he says. The folks at TI hope to have that all-encompassing solution, while their competitors hope that one of the other emerging technologies — laser, poly-silicon, or gas plasma to name a few — holds the key to the future of video projection.



—Tom Butler

Continued on Page 12

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WAR DECLARED

Rumor Has It

reality project called Osmose at a digital art exhibit at the Ricco/ Maresca Gallery in New York City this past winter. Using highend technology including an **SGI** Onyx computer, a VR helmet, realtime motion capture, and live video projection, **Softimage** has set out to create a gentle approach to VR. The project explores the symbolic relationship between self and nature. The immersive journey travels through a dozen virtual spaces, including organic worlds with forests, leaves, and the like. . . . The 1996 schedule for the **Lincoln Center of Performing Arts** in New York City announces the world premiere of *Brain Opera*, an interactive digital event designed by the **MIT Media Lab** under the direction of Tod Machover. More than 100 free performances will be offered at the Julliard School. . . . **Visa** and **Sony** announced a partnership to produce a Web site, called Sony Station, showcasing Sony's products and services. Visa's plan is to provide new solutions for securing financial transactions and gain consumer confidence in the process. Their own site will be hyperlinked to Sony's. . . . A correction to news on **The Learning Company**, previously reported to have been sold to **Brøderbund**. In fact, **SoftKey** staged an aggressive take-over with an offer the Board of Directors couldn't turn down. But don't hold us to it. . . . **Footage.net** is adding *ABC News VideoSource* and *CNN ImageSource* to their online footage library. All of the major news covered by ABC since 1963 is now available through their archives, which can be accessed at <http://www.footage.net>. 

Got News? Send it to *InterActivity*, 411 Borel Ave., Ste. 100, San Mateo, CA 94402; fax 415.655.4360; Internet interactivity@mfi.com.


For a while it was entertaining to take cheap shots at Microsoft's sluggish start breaking into the online market with Microsoft Network. Now that MSN has reached 500,000 members, the thrill is gone. The steep upward curve in membership is evidence of the advantage of including access to MSN in Windows 95. Sooner or later, most people will click on that Microsoft Network button to see where it goes. Then again, there are those who never take anything Microsoft does lightly. As of Dec. 4, 1995, three of them announced their intent to work together and officially declared war on Microsoft.

The challengers are Sun, SGI, and Netscape, and their weapons of choice are Java, VRML, and Netscape Navigator. Sun spent years developing the Java programming language as an alternative to all-in-one operating systems. Then they developed an online implementation of Java called Hot Java, an extensible program that gives Java mini-applications (called applets) enough autonomy to operate on their own. The promise for the future is that computers can be equipped with a lean, rudimentary operating system that loads applications as needed and discards them when they're no longer needed. Netscape joined in and after Dec. 1 began providing integrated support for both Java applets and JavaScript, a crossplatform language based on Java that extends the programming capabilities of Netscape Navigator 2.0 to developers of all levels of experience.

Sun's usual arch enemy, Silicon Graphics, has also been developing online technology for the masses in VRML (Virtual Reality Markup Language), which if you don't already know allows the creation of online 3D worlds. As part of their Dec. 4 announcement, Sun stated that since SGI had done such a good job of defining 3D for the Web, they would incorporate VRML into Java.

SGI, who happened to be hosting the Sun announcement, seized the opportunity to announce plans for a modular Internet development environment, the Cosmo Web suite. Equipped for content creation, crossplatform application development, multimedia browsing, and media asset management, the system comprises four primary elements: Cosmo Create for multimedia authoring, Cosmo Code for Java programming, Cosmo Player browser, and Cosmo MediaBase library and asset manager. The latter provides dynamic storage, retrieval, delivery, and management of multimedia data on the Web and includes APIs to browse, query, and deliver content. Finally, Cosmo MediaBase brings in another co-conspirator, Informix, which has already been working with SGI on relational database APIs. The suite will support HTML, VRML, and Java, and will plug into Netscape's products. MediaBase is designed to facilitate multimedia collaboration and intelligent media browsing.

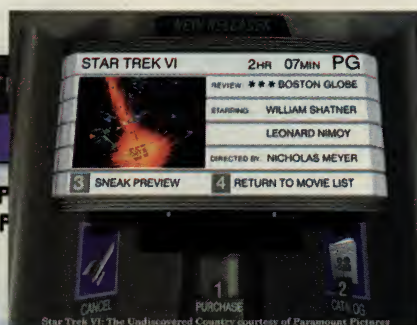
This first-ever public meeting of the Sun, SGI, Netscape mutual admiration society was held at the San Francisco Hilton during the WebInnovation show, an otherwise sleepy event on a rainy day. The challenge to Microsoft was clear. Marc Andreessen of Netscape said, "It's great that companies can work together and not have a lock on technology. It's like one thousand flowers blooming in the desert," he added in a somewhat bewildering poetic aside. Eric Schmidt of the Java development team claimed the Microsoft model — an all-inclusive operating system, dependent apps — would stagnate the industry and that Java's approach with a "stupid OS and smart apps" represents the hope of the free world. Tom Jermoluk of SGI, clearly relishing the battle, commented, "The Web is uncontrollable. Anyone who can keep up is free to play." Their unspoken point was not lost on reporters: VRML, Java, Cosmo and other components are working and demonstrable, in contrast to Microsoft's long promised but undelivered Blackbird.

Several days later, Microsoft responded to the challenge. Bill Gates, in a surprisingly generous mood, admitted that MSN was dead, conceded that Netscape had the edge in terms of market share, and that the Microsoft Network will function merely as an Internet provider built around Microsoft's Explorer. In addition, he announced they would add their own scripting language into the mix, Visual Basic Script, and an implementation of VRML, another open standard, and call it Active VRML. 

—Kathleen Maher

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The GRP Collection, from N2K, Inc., combines a jazz music sampler featuring labels like Decca and Chess, with a catalog/order application. It was authored in OMO.



Logica Interactive Video Environment, for video-on-demand, was authored in OMO. Courtesy of Paramount Pictures.



**Pakistan P
discusses P**

April 11, 1995 • 11:30 am
length: 0:30

17-20 of 26

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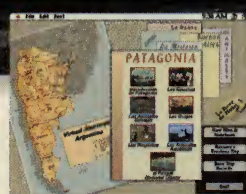
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Commerce Secretary David Barram discusses

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The PC world has been slow to catch up with the Mac when it comes to audio production tools that integrate digital audio with MIDI control. But that's beginning to change. Steinberg's Cubase Audio 1.6 For Windows (\$799 US, \$1,095 Canada, free to owners of version 1.5) combines extensive MIDI sequencing, music notation printing, and audio recording, editing, and processing. Processing functions include normalize, time-stretch, pitch-shift, and reverse. Additional hardware is required; so far, Cubase Audio 1.6 For Windows supports Windows-compatible soundcards as well as Digidesign's Session 8 and Yamaha's CBX-series recording systems.

Meanwhile, Cubase Audio 3.0 TDM is available for the Mac (\$799 US, \$1,095 Canada). Coupled with Digidesign's Pro Tools III hardware, it provides up to 48 simultaneous tracks of hard disk recording, editing, and processing (16 tracks per Pro Tools III card). Not only does 3.0 incorporate MIDI, notation, and audio, it supports multiple simultaneous QuickTime clips as well.

The letters TDM signify Digidesign's open-platform multichannel digital audio bussing spec, which enables signals to be routed among various microprocessors connected to the TDM bus. With the addition of Digidesign's DSP Farm card and third-party plug-in software, a growing number of realtime DSP effects are available. All audio processing controls appear onscreen, with internal signal routing represented via a graphic patch bay.

Steinberg's own TDM plug-ins include DeClicker click eliminator and tape dropout masker (\$999 US, \$1,369 Canada), Spectralizer sonic enhancer (\$1,399 US, \$1,899 Canada), TimeGuard timing analyzer for correcting DSP delays (\$149 US, \$199 Canada), Tun-A guitar tuner (\$149 US, \$199 Canada), and VFX collection of effects including autopan, chorus, plate reverb, stereoizer, and Y-cables (\$399 US, \$549 Canada).

• Steinberg, 9312 Deering Ave., Chatsworth, CA 91311-5857; vox 818.993.4091; fax 818.701.7452; Internet steinberg@aol.com, 71333.2447@compuserve.com.

Reader Service #125

Accelerated 3D for Win95

The force of Windows 95 is only beginning to be felt. Win95's impact on the 3D market will be accelerated — pardon the pun — with the introduction of a new GLINT-based graphics ac-

celerator chip (\$150 per unit in OEM quantities) and OpenGL driver (free of charge to hardware customers) from 3DLabs, the chip supplier behind products such as Creative Labs' 3D Blaster.

The 3DLabs chip enables applications designed for Windows NT and OpenGL (Silicon Graphics' highend 3D API) to run under Win95. It supports 100% of OpenGL raster-



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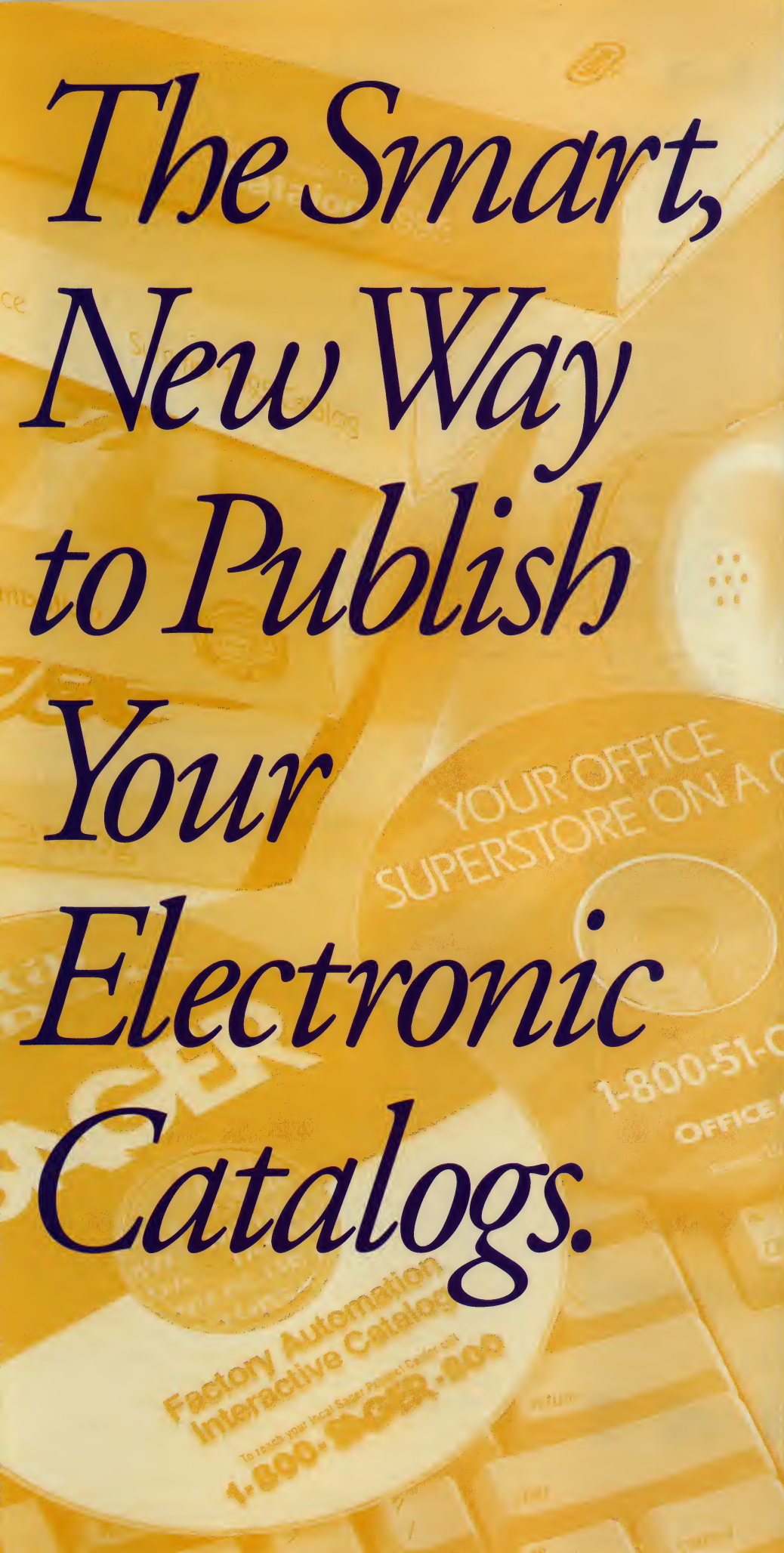
Graphics rendering took a dramatic step forward when Lightscape's LVS (Lightscape Visualization System) was introduced in January 1995. LVS incorporates a proprietary implementation of radiosity, a method of calculating 3D light distribution that accounts for soft shadows, indirect illumination, and color bleeding. One result is enhanced realism for everything from virtual sets to movie special effects, from lighting design to architectural visualization. And because radiosity data is stored as an integral part of the original 3D surface, rendering is viewpoint-independent. Scenes don't need to be re-rendered as POV changes. This makes for significant time savings, particularly in render-intensive projects such as animation. Previously available for SGI workstations and servers (\$4,995), LVS now comes in a PC version (\$2,995) that provides identical functionality under Windows NT and imports files from leading NT-based CAD and animation applications including Microsoft Softimage, SGI Wavefront, and Autodesk 3D Studio. Imported files retain material properties such as texture mapping.

LVS uses a detailed physical model of light based on photometric standards established by the Illuminating Engineers Society (IES). Thus it accurately simulates not only point, linear, and area sources in a variety of distribution types, but halogen, fluorescent, 65W pearl white, and other kinds of artificial light. Furthermore, data from lighting manufacturers can be entered directly in IES, CIE, CIBSE, and LTL photometric formats. Natural lighting is defined in terms of location, date, time, and degree of cloud cover.

Output is 24-bit RGB in any resolution with an optional 8-bit alpha channel for compositing. LVS supports SGI RGB or RGBA formats (which can be converted into other standard formats using utilities from SGI) as well as 360-degree image generation for QuickTime VR.

• Lightscape, 1054 Saratoga-Sunnyvale Rd., San Jose, CA 95129; vox 800.343.0073, 408.342.1900; fax 408.342.1910; Internet info@lightscape.com, <http://www.lightscape.com>.

Reader Service #126



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ization capability for high-res Gouraud shading with subpixel correction, 32-bit Z buffering, fogging, blending, anti-aliasing, overlays, and stencil buffering. The immediate result is that programs such as Microsoft Softimage, Intergraph MicroStation, AVS AVS/Express, and Pro/Engineer by Parametric Technology run smoothly on consumer-grade desktop systems. This increases pressure on manufacturers to provide NT versions of their 3D packages, while the driver (official name: GLINT Installable Client Driver) further broadens the market for 3D-capable products.

In addition to OpenGL, 3Dlabs plans to support Microsoft's DirectDraw, Direct3D, and Reality Lab APIs for lower-end applications.

• 3Dlabs, 2010 N. First St., Ste. 403, San Jose, CA 95131; vox 408.436.3455; fax 408.436.3458; Internet <http://www.3dlabs.com/3dlabs>.

Reader Service #127

Cable Modem Ready for Prime Time

Suddenly, the greatest hope for the Information Superhighway isn't ISDN, fiber, or satellite delivery, but the cable modem — a technology that promises to turn the cable TV infrastructure into a high-speed data pipeline. After hedging their bets with the KAYAK ITV set-top box and MediaStream video server, Hewlett-Packard has announced the QuickBurst cable modem (price TBA), scheduled to ship by

midyear. QuickBurst is intended for sale to broadband service providers who will, in turn, offer it to their subscribers. Apart from the business model, the results are expected to match current online activities including email, bulletin boards, and newsgroups — but faster by a factor of several hundred. Furthermore, cable modems won't require a dedicated phone line.

QuickBurst is only part of the equation. The other is HP's Broadband Interactive Data Solution (BIDS), which enables Internet access, service delivery, and multimedia data management over a hybrid fiber/coax plant. BIDS comprises a server complex at the headend for network management, security, access control, content storage, subscriber data processing, and Internet access plus the QuickBurst Network, which connects the headend to a desktop computer in the home.

• Hewlett-Packard, 800 S. Taft Ave., Loveland, CO 80537; vox 970.669.8000; fax 970.635.0997.

Reader Service #128

Welcome to the Virtual Studio

Multimedia networking is a major hurdle for large-scale creative operations, as media must be captured, archived, distributed, annotated, processed, and integrated within a seamless environment. CreativePartner from Emotion is an AppleTalk-based client/server application for the Mac that manages the dis-



INTERACTIVE VIDEO UPGRADE

Introduced during the late '80s, Vivid's Mandala was one of the first interactive video tools on the market. It composites a video image of the participant with a background image that can respond to the participant's actions within the screen space. Without being encumbered by input devices of any kind, participants can "touch" video icons and sprites in virtual space to score points, manipulate animations, paint, play virtual musical instruments, and the like.

Vivid now offers an updated version of the Mandala VR Engine at a lower price (TBA). The system consists of a Pentium PC with video peripherals enclosed in a fiberglass-reinforced plastic arcade module. The Engine runs Mandala VR Modules, of which 10 game titles are available.

• Vivid Group, 317 Adelaide St. W., Ste. 302, Toronto, Ontario, Canada M5V 1P9; vox 416.340.9290; fax 416.348.9809; Internet vivid@terraport.net, <http://www.vividgroup.com>.

Reader Service #129



Stock Media ONLINE

Search and order stock photos, illustrations, textures, fonts, and maps over the Internet. Picture Network International (PNI) has launched Publishers Depot, an online vendor of digital images.

Search through a database of more than 350,000 elements using commands that read like conversational language. View thumbnails, then download low-res comps to use as placeholders. Get licensing information as well as rights and clearance status of a particular image. Finally, download high-res files directly or call to have them delivered in whatever format you need.

Visitors to Publishers Depot can register online and pay an annual access fee of \$49 (free until April 1, 1996). Per-image prices are assessed on a per-project basis starting at \$30 per 300k image. Images are available in file sizes of 300k, 1.5MB, and high-resolution (usually 18MB).

Currently, more than 50 stock media providers participate in Publishers Depot. PNI plans to add stock music and sound effects, 3D models, and video as well.

Picture Network International, 2000 14th St., Ste. 600, Arlington, VA 22201; vox 800.764.7427, 703.312.6210; fax 703.807.2741; Internet <http://www.publishersdepot.com>.

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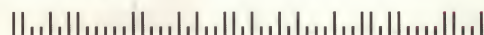
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NEW GEAR

tribution of multimedia documents over LANs and WANs (\$495 for 2 users, \$1,495 for 10 users, \$2,495 for 20 users, \$4,995 for 50 users). De-

signed to handle the large file sizes generated in the processing of video, audio, photography, graphics, and layout, it maintains an audit trail



3D With NT

Although they insist that Silicon Graphics has an important role in their future, representatives of Microsoft's Softimage division are touting the new generation of Windows NT workstations as providing equivalent performance at half the price. It's a forceful way to introduce Softimage 3D 3.0 For Windows NT (\$7,995). The NT version duplicates the modeling, animation, and rendering capabilities of the SGI program and boasts a Unix-compatible file format. Microsoft claims performance as good as or better than Softimage 3D running on a SGI Indigo2 Extreme (based on benchmark tests performed in cooperation with various computer and graphics card manufacturers).

To make their point even more dramatically, through Feb. 29, 1996, Microsoft is offering a variety of NT-ready turnkey graphics systems, complete with Softimage, at can't-beat prices. Two Intergraph bundles are available: a TDZ-300 CPU (built on a 150MHz Intel Pentium Pro processor), 21-inch MultiSync monitor, GLZ1 graphics accelerator, 64MB RAM, and 2GB hard disk (\$15,495) and the same computer and monitor with a GLZ2 accelerator card, 128MB RAM, and 4GB hard disk (\$22,495). A MIPS-driven NetPower system based on a 200MHz FAST-series R4400 CPU with 17-inch monitor, AccelGraphics AG500 graphics accelerator, 64MB RAM, and 1GB hard drive can be had for \$14,995, while a NetPower 250MHz FAST-series R4400 with 21-inch monitor, AccelGraphics accelerator, 64MB RAM, and 2GB hard disk is going for \$19,995. They're also offering two systems based on DEC machines: an Alpha XL 266, 266MHz EV4.5 (based on the Alpha 20164A processor) with 21-inch monitor, AccelGraphics AG500, 64MB RAM, and two 1GB hard disks (\$18,495) and a sleek AlphaStudio Pro 266, 266MHz EV5 (based on the Alpha 21164 processor) with 20-inch monitor, AccelGraphics AG500, 64MB RAM, and 2GB hard disk (\$22,995).

Softimage 3D Extreme, with features such as mental ray/distributed rendering, meta-clay organic modeling, and particles, is expected to hit the NT platform within the next several months.

• Softimage, One Microsoft Way, Redmond, WA 98052-6399; vox 800.576.3846, 818.365.1359; fax 206.936.7329; Internet <http://www.softimage.com>.

Reader Service #133

of all transmissions and checks target computers to make sure adequate space is available to receive transmitted data. The system accommodates Mac, Windows, and Windows NT clients, and supports existing networks from Ethernet to ATM and from modem lines to ISDN, Frame Relay, T1, and T3.

CreativePartner is designed to encourage more efficient collaboration both within the LAN and beyond to facilitate a virtual studio environment. The software delivers digital files faster than traditional methods while providing guaranteed package delivery and confirmation. Using electronic post-it notes, drawings, and voice recording, users can attach comments (stored in a separate file) to media elements without altering the elements themselves. In the case of network failure, the server restarts transmissions at the point of interruption (rather than from the beginning).

The software supports a variety of file formats and data compression schemes and offers an MPEG Decoder Card (\$695) to create the first solution, enabling viewing and annotation of MPEG movies on the Mac.

• Emotion, 2650 E. Bayshore Rd., Palo Alto, CA 94303; vox 800.385.6776, 415.812.9000; fax 415.812.9009; BBS 415.428.3838; Internet customer_success@emotion.com, <http://www.emotion.com/emotion/>.

Reader Service #131

Audio Batch Processor

With the increasing demands upon digital media producers, the ability to process files in batches is a major productivity booster. Sound SuperEdit 1.0 (\$499) processes any number of audio files in a single operation, handling a variety of editing, naming, amplitude processing, and format conversion chores. Functions include add fade in/out, sample-rate convert, channel merge/split, requantize, and format convert. In addition, the program performs automated audio region identification and editing, automated file naming under script control, and cross-checking of audio and text.

Sound SuperEdit reads Sound Designer II format complete with regions and markers, AIFF, and WAV files, and writes Sound Designer II, AIFF, WAV, VOC, 8SVX, RAW, and QuickTime formats. Dissimilar file types can be processed in a single batch.

• Binari Sonori c/o RiCharde & Co., 444 Airport Blvd., Ste. 207, Watsonville, CA 95076; vox 408.688.8593; fax 408.688.8595; Internet richarde@got.net.

Reader Service #132

VR Support

To keep users of their World Up VR development tool current with the most recent up-

NEW GEAR

dates, utilities, and technical information, Sense8 is launching a free "subscription" support service. Available to all registered users, the service provides 3D models, application scripts, data sets, and utilities distributed via the company's Web site plus access to SIGs through which questions can be answered and tips can be exchanged. A refinement of Sense8's earlier WorldToolKit, World Up is intended to facilitate the creation of interactive worlds without resorting to C programming.

• Sense8, 100 Shoreline Hwy., Ste. 282, Mill Valley, CA 94941; vox 415.331.6318; fax 415.331.9148; Internet info@sense8.com, http://www.sense8.com.

Reader Service #134

Still Images to Video

Take still images or 3D models and turn them into video clips with VideoCraft (\$199) for Win95 from Andover Advanced Technologies. The program provides seven customizable effects (overlay, stylize, colorize, distort, morph, transition, and warp) that can be applied to still or moving images over time. Three effects can be applied simultaneously along with alpha-channel compositing. VideoCraft comes bundled with Andover's Video Action ED, a non-linear video editor, and Arena Design ED, a 3D modeling and animation program.

• Andover Technologies, 532 Great Rd., Acton, MA 01720; vox 508.635.5300; fax 508.635.5326; Internet 74774.1423@compuserve.com.

Reader Service #135

Autodesk to the Max

Believe it or not, when Autodesk 3D Studio first appeared more than five years ago, it received raves for its user interface. Times change, and for all its power and openness, the program has been in need of a face-lift for a while. The trick has been to move the product from DOS to Windows without making it a tradeoff between point-and-click convenience and raw performance. The overhead incurred by 32-bit Windows, in this case Windows NT, can be substantial. (NT is the platform of choice not only because of its stability but also for its strengths in networking and multiprocessor support.)

3D Studio Max (\$3,495) adopts elements from popular modeling and rendering programs by Caligari, Visual Software, Lightwave, Strata, and Hash as well as from highend tools such as Alias and Microsoft Softimage. Combined with the Windows GUI, the result is a dramatic improvement in the program's modeling capabilities. (Note especially the tilted ground plane that so many artists regard as their handle on the 3D universe.)



Windows on the Web

Leveraging the vitality of the Windows NT operating system to bolster the dynamism of the World Wide Web, Durand offers MindWire NT (\$1,495), a 32-bit multithreaded server optimized for delivering interactive content. The architecture facilitates client/server applications accessible by modem, LAN, or WAN. Capabilities include hyperlinking, multitasking, and a built-in database API. Security and auditing features keep track of user profiles and activity, and application files can be updated and launched automatically each time a user connects to ensure that users have the most current information.

MindWire comes with Web server software; Internet groupware for email, chat, and public message forums; a developer's guide to creating Internet apps; and a utility for creating Windows menus. A free 30-day trial version of MindWire can be downloaded from Durand's Web site.

• Durand, 147 Castilian Dr., Santa Barbara, CA 93117; vox 805.961.8700; fax 805.961.8701; Internet http://www.durand.com.


Reader Service #137

Still in alpha as of this writing, the program is being developed in conjunction with San Francisco's Yost Group, making it likely that it really will ship in the first quarter of 1996. The buzz is good, and Autodesk themselves must be feeling pretty confident — the announced price is higher than that of the current version. To prime

the pump, 3D Studio 4.0 customers can upgrade to Max for \$495 during the first quarter of 1996. After March 31, the upgrade will cost \$995.

• Autodesk, 111 McInnis Pkwy., San Rafael, CA 94903; vox 800.525.2763, 415.507.5000; fax 415.491.8311; CompuServe go ammedia.

Reader Service #136



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THEY SAY ABSOLUTE BUT HEY, IT'S A HE



These are just three of the animators at Industrial Light & Magic who helped to create the 3D animations for *Jurassic Park*, *Jumanji*, *The Mask*, *Casper*, and more than there's room here to list. (Daniel Jeannette from the rhino, Tom Bertino riding Milo, Geoff Campbell on the raptor.)



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multimedia is one of those words with many connotations. To consumers, multimedia can be anything from electronic games to interactive encyclopedias to edutainment titles to Robert Rauschenberg paintings. Those who count themselves among the sort of savvy might throw the Internet and VR into the list. If you toss "business" in front of "multimedia," people think presentations and start talking about the Internet as a glorified *Home Shopping Network*. ■ Practical, hands-on business applications and multimedia aren't your usual bedfellows. So when Hands-On Technology (HOT) marketing director Rick Davis dropped by the *InterActivity* offices to show us *Crush*, "an interactive marketing tool that lets users size up their competition and create effective business strategies," we weren't quite sure what to expect. ■ Spreadsheets with pictures? Spreadsheets with video? Spreadsheets with . . . more strategic product planning firepower than we'd ever seen

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crush

condensed into a single piece of software on CD-ROM. *Crush* is an all-in-one market analysis tool, training method, and workbook, featuring a complex database for vital stats, step-by-step exercises, and very potent case studies of strategic situations in a variety of markets. It is based on reknowned marketing guru Regis McKenna's techniques for assessing market strengths and weaknesses and using them to crush (wordplay intended) your competition. All of which may explain how advance orders for the cross-platform single-disc *Crush* (priced at \$499 per copy, gold-embossed leather portfolio included) topped \$1 million before it shipped in the summer of '95.

What went into building an interactive multimedia product for the business community? What were the challenges faced by the development team? What were the interface design issues? What authoring tools were involved and how did the programmers integrate *Crush*'s database structures?

We asked *IA* contributing editor Ilyse Rimalovski to take the case and were surprised to find that both she and *InterActivity* Interface Design columnist Eric Gould had worked on *Crush* while on staff at vivid studios. vivid (that's no typo, vivid must have a thing for e. e. cummings) was the original development team on *Crush*, though they were ultimately taken off the project.

The story that follows is, according to Ilyse, "a story many developers know all too well. It's



The Mentor, Regis McKenna, is like an online help function. He talks users through sections of the *Crush* program, explaining what to look for each step along the way and giving examples.

a story of good work that will never be seen, bungled management, slipped schedules, and 20-hour days full of sweat and passion that were devoted to making *Crush* the breakthrough product that it is."

The Background

Hands-On Technology was founded in 1993. Its original business plan outlined the creation of a set of tools and information that catered to the business community. Tools of continuing value. Multimedia tools based on methodologies developed by Regis McKenna, inspired by a project codenamed *Crush* that he had worked on at Intel in 1979.

Crush is the first of those tools. The first title in the HOT Mentor Series, it is a hybrid business app and information resource. "The goal was to obliterate the need for a manual or user training of any kind. We made a decision to ignore multimedia literacy and focus only on marketers

and other business professionals and their needs," says Michael Mellin, HOT's CEO, president, and business visionary. "Within the business community, we found there were already a surprising number of multimedia-capable computers in the workplace."

The Product

Targeted to anybody who conducts marketing, *Crush* assumes that most of its users are already familiar with competitive analysis but not necessarily with the broader issues of how social and economic trends affect their ability to judge their products.

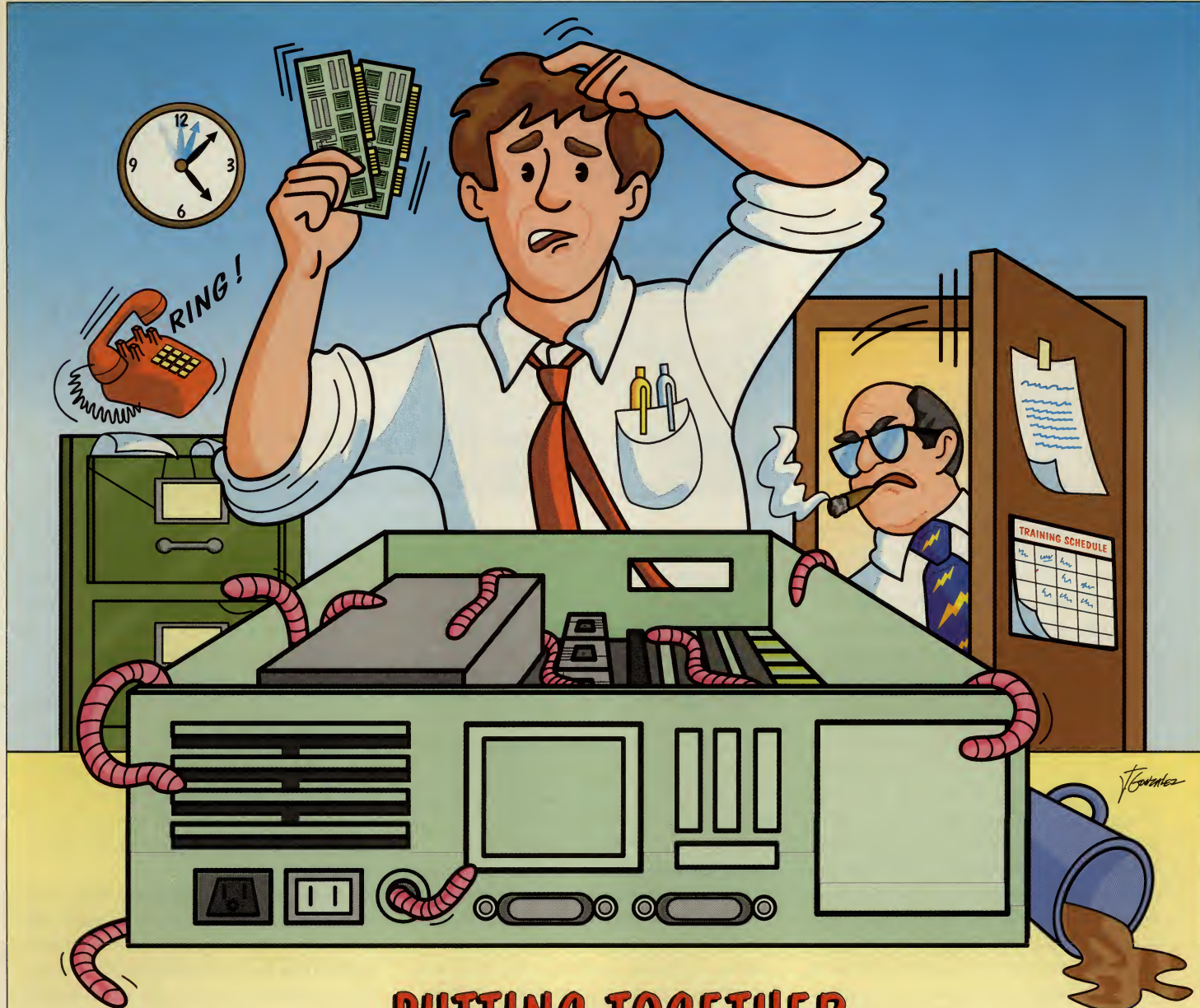
Crush follows the paradigm of a business seminar. After installing it on your PC or Mac (a process that takes a bit of time and has a 12MB footprint), *Crush* takes you through a step-by-step process that gives you tools to develop and analyze your market position relative to your competition. Along the way, you are required to build profiles of your product, market, economic and social conditions, competitive strengths and weaknesses, and a lot more. Users have the option of using *Crush* in a linear fashion or taking detours to explore a particular topic at any time.

A talking head of Regis McKenna greets first-time users with an explanation of *Crush*'s mentor technology. But as they go through the process of putting together a market profile, users will hear a voice other than McKenna's, an idea suggested by lead designer Eric Gould. Gould observed that people often get frustrated with software personalities just as they do with voices of automated telephone menu systems. Mellin adds, "We made a conscious decision to use a separate voice to explain how to use the product because we didn't want to under-value Regis' expertise. He is the storyteller."

Crush is one part tutorial, one part context-sensitive online help, and its table of contents includes comprehensive information and ex-



Crush prompts you to examine different trends that affect your business.



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Crush

ercises for determining market trends, analyzing strengths and weaknesses, role playing, and creating action plans. Twelve case studies in the product incorporate two and a half hours of video and audio tutorials and demonstrate many of *Crush*'s principles in action.

Users' competitive positions are always mapped out in graphs and charts to help them gauge where they stand in relation to their competitors. Features enable users to perform a variety of helpful tasks such as changing the axes of a graph, evaluating *holes* that represent opportunities, and combatting *clusters* that symbolize threatening information. This data is automatically listed in the competitive plan to arrive at a list of objectives. Users can take snapshots of screens and incorporate them into formal presentations, outputting color slides directly from the desktop.

The "*Crushing The Competition*" portion of the program requires users to understand their competitors' and customers' needs by providing electronic forms that ask, "Who are your customers? What are their needs? What kind of services do they require?" Still another feature lets users see how they are viewed by their competitors. The "*Crushing Yourself*" section enables users to invert their analysis, role play with competitors, and generate new scenarios. As a way of optimizing the learning experience, users must complete certain parts of the title before proceeding. McKenna, the talking head mentor, is always available onscreen to comment about con-



The market trends summary. Clicking on the paper icon lets users link notes or information about a particular trend. Checking some items with large blue marks isolates them for further analysis.

tent-sensitive information as it relates to the user's own input.

The heart of the program is a highly customizable database that records and organizes each piece of user information. The text throughout the title is fully editable and linkable to other relevant sources of information, even to the Internet, and there's room to record notes along the way. HOT learned that users still want printed information, leading them to include the capability to produce compelling paper takeaways that would maximize *Crush*'s value.

Early Development

HOT hired San Francisco-based vivid studios to design and develop a working prototype of *Crush*. Instead of simply creating an electronic version of McKenna's latest book, "We came up with the concept of an electronic workbook, a kind of interactive expanded template, that was more productivity application than content title," explains Nathan Shedroff, vivid's cre-

ative director.

The next question was how to work with vivid to build it. Gould, now principal of San Francisco-based MONKEYMedia, was hired by vivid to create a product based on the proof-of-concept developed by Shedroff. "The task was to take the Regis methodology, his style of doing product positioning that evolves from day to day, and codify that into a single process," Gould says. "Where's the consistency? What is the shape or architecture that holds that thought process? How do we invite people to think more holistically about product positioning in Regis' style?"

Adopting a concrete interaction style, Gould wanted to give people the hands-on feeling that they are in control of their own process with the ability to grab and manipulate objects on screen. [See *InterActivity*'s January '96 Interface Design column about styles of interactions.] "Grippies," a concept borrowed from a Braun razor design, were put on anything moveable, enabling people to reorganize these objects and assemble information to suit their personal styles.

Gould explains, "It was a tough challenge to figure out how to make people feel comfortable and familiar while easing them into a broader and hopefully more competitive way of looking at the market."

The developers worked to incorporate tasks the computer did well that people couldn't easily generate themselves, charts and graphs for example. Another focus was how to encourage people to freely explore without solely worrying about the obvious issues, to look at things together and see relationships, to stand in their competitors' shoes, *Crush* themselves, and make sense of it all. Reusability was also a factor, encouraging people to constantly work with the software to accommodate changes in the marketplace, products, and competitors, hence arriving at a spectrum of analyses over time.



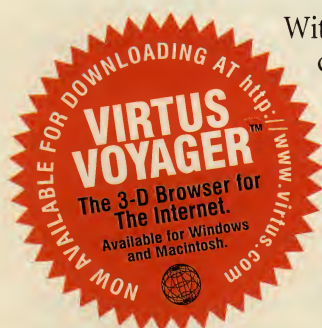
Personal preferences vary greatly when it comes to viewing data graphically. Some data may be more easily understood from one orientation than another. Users can swap x and y axes for alternate viewing perspectives. This may seem gratuitous, but charts look different when axes are exchanged.



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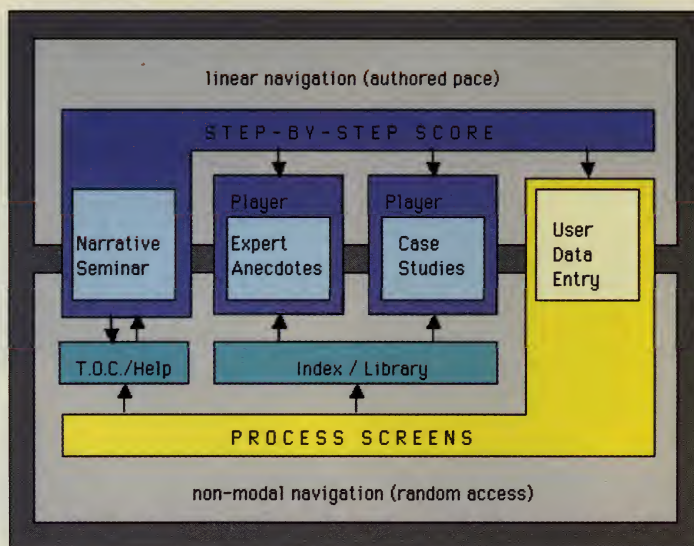
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Crush

A Change of Hands

With *Crush* 80% complete, HOT introduced a new strategy to complete the project inhouse after months of mounting frustration over slipping schedules. HOT conducted market research to determine how best to develop the product and learned that their target users wanted information tools with a software technology spin rather than a sophisticated multimedia design. "We had them rank items of importance and the toolset rated 25 times more important than the multimedia look and feel," says Mellin. "We always planned to have a studio inhouse and it didn't make sense to continue engineering at a design house."

Perhaps, but other parties saw things differently. "We were building the company that they wanted," says vivid president Henri Poole. "Their objectives changed and they didn't do a good job communicating that information." [See "Crushing Each Other" below.]



Expert Process Technology Architecture. This model affords two modes of user interaction: narrative seminar (tutorial) and productivity process (application). Both modes provide access to all parts of the product, including the narrative, expert anecdotes, case studies, sample data, and user data entry. As a result, users can easily switch between different ways of using the product.

HOT realized their need to be able to produce several products without depending on a new outside production company each time. Furthermore, while praising vivid's sense of design, HOT conveyed a lack of faith in vivid's abilities to pull it all together. "But HOT was under the illusion they could just take the project away and find people to pick up where they left off," explains one anonymous source. "It was never a technical issue."

In truth, vivid hired an excellent development

team whose programmers included Larry Doyle (who went on to rescue The Rolling Stones' *Voodoo Lounge* CD-ROM as lead programmer), Iain Lamb (lead programmer of the new Residents title, *Bad Day on the Midway*), Don Brenner (who worked on *The Daedalus Encounter*), and JA Nelson (who has a peerless reputation among the digirati).

Says original *Crush* lead programmer Doyle, "vivid did an excellent job of taking a tremendously complex subject and turning it into a sophis-

crushing each other

the publisher/developer relationship is ideally a marriage of vision and the ability to make it real. Yet when inevitable problems are not handled gracefully and forthrightly, distrust and dark politics can compromise the integrity (and completion) of the product at stake. While the making of *Crush* has a happy ending, it serves as an example of just how thorny managing the development process can be.

The following is "what really happened" according to vivid studios, the designer and original developer of *Crush*.

The Beginning

The objective was to work with Regis McKenna and his staff to create compelling software that would embody McKenna's marketing savvy and enable customers to use that information productively. vivid applied its understanding of multimedia design to help McKenna see beyond simple electronic versions of his books until he felt comfortable saying, "Yes, this is what I want."

Early Development

vivid built screens and samples of a proof-of-concept for Hands-On Technology to use as a tool to encourage investment in the project. Although many of the ideas behind *Crush* were evident in the samples, the purpose

was to sell the concept and not to explain the product. vivid created a video incorporating interviews and project shots.

From Prototype to Product

Next, vivid built a prototype that they could test with users and develop further, hiring Eric Gould as lead designer to create the architecture, the linear tutorial, and a graphical interface that would functionalize McKenna's marketing style to enable people to think like him without even realizing it.

"It needed to be able to scale to a large amount of data, have internal consistency, and a flexible yet reliable relationship between the coach/mentor and the non-modality of being able to get from one type of analysis to another," explains Gould.

This took a fair amount of time and money, but vastly below the cost of most software products. During this phase, vivid learned more fully what it would really take to develop the whole title. A team of programmers were given the prototype and asked to build the end product, incorporating complex functionality into a streamlined interface.











Without enough development money to fund quality C coding from scratch, vivid decided to develop *Crush* in an early, incomplete version of Macromedia

ticated, well-crafted title that we are all very proud of." Doyle praises Director 4.0 as an excellent tool — Lingo's object-oriented architecture enabled the team to divide their work easily, integrate the parts, and create a sophisticated database. Doyle recalls, "I had 240 hotspots on one screen."

Still, instead of having vivid document *Crush* code up to that point, HOT spent months looking for qualified programmers of their own to start coding inhouse. Mellin admits, "It is a very small universe of people who can build a compelling multimedia title, understand the content, and have powerful engineering capabilities." vivid estimates that lack of documentation cost HOT at least six months to a year's worth of development time.

Luckily, they found Marvin Scaff, now HOT's director of engineering, lead programmer, and architect of *Crush*, who is building their new production studio in Florida. "Marvin was a genius," Mellin says. "All of the functionality of the product was proprietary coding developed exclusively inhouse, apart from the tools." While Mellin credits vivid as the designer of *Crush*, "Most of the multimedia content was substantially reworked, edited, reorganized, and expanded by HOT from the prototype."

With the title now complete, Poole responds, "We are pleased that HOT has programmed an excellent first product based on 20 months of vivid's design and media production. vivid and

#	 		 Porsche	 Mitsubishi			
		STRENGTH	RATING	WEAKNESS	STRENGTH	RATING	WEAKNESS
Recession		Porsche shareholders willing to invest for long term payoff	1	Closely held, somewhat limited access to capital markets	Staying power. Part of large industrial group, Ford investment	2	Competing with other Mazda & industrial group priorities
Price		Less expensive than Italian exotic cars, whose prices rose even faster	1	Affordable by only the most affluent	Sports car experience for under \$20,000	4	Low price creates skepticism among sports car purists
Practicality			0	High periodic maintenance cost. Unusable for basic family transportation	Affordable second or third car. Japanese reliability.	3	Growing families compete for space & cash. A sports car is more of a luxury.
No Business Deduction			1	Excludes buyers who require tax deduction to afford a Porsche	Mitsubishi not purchased as a business vehicle	3	Non-deductible consumer interest effectively increases price.
Automation		Re-tooling for common components. Hand crafted excellence.	1	Limited automation opportunities due to trade unions, design and work rules.	Automated, relatively high volume factory	4	

Competitive analysis ratings summarize the market's perception of a competitor's strengths and weaknesses.

Regis McKenna worked long and hard to produce a genre product and define a new product category. We are happy to see that HOT is making big business with this product."

The Inhouse Studio

In the name of stability and efficiency, Scaff found himself in the unenviable position of trying to pick up where vivid left off. Staying true to the programmers' code of code, Scaff rewrote everything from scratch. "I would have

liked to have been involved earlier," says Scaff.

Because *Crush* needed to be read by both Mac and Windows platforms, Scaff was charged with developing custom Lingo XObjects to expand Director's crossplatform capabilities. These XObjects would perform tasks such as managing text entry, opening and launching linked files, creating offscreen bitmaps for rotated text, and printing custom reports as well as other things. He arrived at a combination of coding 30% in C and C++ and 70% in Director.

Director 4.0 since it could be used as an engine for the animation and interface. The ambitiousness of Gould's design meant that vivid had to custom build several functions as XObject plug-ins. Reportedly 50% of the programming time was spent working around Director's oddities and prerelease bugs.

In short, vivid was building an extremely complex title using an authoring system that was in buggy alpha and beta stages throughout the project's development. According to programmer Larry Doyle, vivid's programmers made Director do things that amazed even the developers and programmers at Macromedia. But it was taking time and more money.

The Showdown

Final production was going reasonably well, but in creating something groundbreaking, for every two problems solved, two more were uncovered. HOT grew impatient. They brought in new CEO Michael Mellin, and once in charge, he brought new interests with him. Suddenly, HOT found money to create an inhouse studio with its own developers. Their hope was to own wholly everything proprietary.

According to vivid studios president Henri Poole, "They didn't completely understand the complexity of the engineering tasks, and frankly, we didn't either. We could have re-assessed the schedule more accurately." Poole concedes that HOT was under pressure to ship, and they needed a schedule to address that realistically.

Perhaps it would have seemed fair to the team at vivid if HOT moved things inhouse for the next project since subsequent titles were already planned. "But they were a little too late," recalls one source. "Not when the project is 80% done. That's not fair."

Relationships soured further. Then HOT took *Crush* from vivid. Then they gave it back. Then they took it again. People lost jobs. People working on various aspects of the project weren't giving each other the full story about how long development was taking and how much time was needed to finish. This incomplete information cost HOT about a year's worth of development time. The fate of *Crush* hinged on HOT's ability to find their own crackerjack programmers who could pick up the pieces and make it fly.

Where Credit is Due

That was then. Says HOT's Mellin, "It's very fair to credit vivid with the graphic look and feel of *Crush*, especially the almost sensuous look of the screens. HOT and vivid worked together through several prototypes to the final prototype that served as the basis for the actual product. I hold vivid in great respect, and the decision to complete *Crush* inhouse was dictated by business considerations to which vivid's actual performance was almost completely irrelevant. I would gladly work with them again."


Gould, who led MONKEYMedia's production of the *Crush* sneak preview and demo CD, says, "While I'm a bit disappointed that some of the neat interaction techniques didn't make it through to the currently released version, overall I'm pleased and thrilled to see that it's finally out." Some say it still looks and feels like the prototype, it just doesn't work as cool.

How does vivid want its contributions to be counted? Reflects Poole, "Like the Great Oz, we were always there behind the scenes." vivid studios has moved from creating CD-ROMs to online experiences with companies such as Microsoft, Silicon Graphics, and Sony.

Crush

INSIDE OUT

LEAD PROGRAMMER MARTIN SCAFF ON HIS PROGRAMMING TECHNIQUES

 We were able to complete *Crush* by implementing traditional software engineering methodologies. The project was approached more from an application perspective than multimedia title development.

Dissecting the Persistent Object Storage Manager (POSM)

The datafile that *Crush* saves and loads is an ASCII file written to disk using the fileIO XObjects. One of the limitations of the fileIO XObjects, or rather a bug that was discovered in the Windows version, is its failure to test whether a file exists before overwriting it. The Mac handles this with its operating system, but under Windows it has to be tested specifically. Fortunately, Macromedia provided the source code for their fileIO XObject for Windows, so I didn't have to rewrite it from scratch.

The data that composes a dataset is built in memory and then written to disk in one write operation. This also occurs when the file is loaded back into memory. POSM maintains lists of all persistent objects used in *Crush*. When the user chooses SAVE from the FILE menu, the `hmSaveFile` method is called within POSM.

To load and save the objects, I use Lingo's item of construct by alternating between an object delimiter and a property delimiter. As I build the data in memory to write to the datafile, I keep an index of where the objects start in the file and a count for each type of object. When the file is written to disk, first I write out a header that contains the version number of POSM and the position and count for each object. To delimit objects I choose a pipe symbol, and to delimit properties I choose a TAB. For each list of objects, I iterate through each one and build a tab delimited string. I concentrate this string in memory and append an object delimiter to the end of each record. I repeat this for every list of objects stored in a dataset.

With this complete, I use the `mWriteString` method of the fileIO XObject and save it to disk. I read the file back in after the user chooses OPEN from the FILE menu. I call it the `hmOpenFile` method. This approach uses the `mReadFile` method of fileIO to read the whole dataset back into memory. Then I set the item delimiter to read objects and parse the data read in from the file, reading just the header. I know from the offset into the dataset where each object starts. I load the properties from each object and pass them as arguments to each of the methods in POSM that births the object and adds it to the internal list for that type of object.

This technique can be adapted easily to other Director applications that require persistent objects.

On Performance: Resolving Cast Names

The way Lingo resolves cast names is a painfully slow process, especially with a large cast. This becomes a double-edged sword in the course of developing a title in Director because it is necessary to import new cast members and rearrange the cast. I overcame this by writing a script that resolves cast names to their numbers at authoring time instead of at run time.

This shaves several minutes off *Crush*'s startup time. The 1.0 application now loads in less than 10 seconds on a Quadra 840. Before I came up with the `ResolveCastNames` script, it took more than a minute. As part of the development process, I now keep a copy of our

Crush

As Scaff recalls, "When I first saw the spec, I sat down and figured out how to create a mechanism for storing and loading all of the data. That was the first piece."



Traditional pop-up menus are good for long lists, but radial menus leverage off of people's innate kinesthetic memory by providing a fixed spatial arrangement of a small set of options. People learn to use this interface device incredibly fast and can eventually make choices without looking.

The menu pops up when the user presses on a competitive rating. The center of the menu displays the current rating. Moving the cursor around highlights wedges under the cursor. Releasing while over a wedge selects the value in that wedge. Releasing at the center or beyond the edge of the menu closes it without making a new selection.

The user can view the worksheet in either numbers or rating balls. Both are indicators of how competing products or services rate on individual market trends. Interestingly, many people expect to like numbers better (and that's why they're included as an option) but find balls easier and quicker to read en masse.

Scaff developed a proprietary object database technology for HOT called Persistent Object Storage Manager (POSM), which allows *Crush* to store large datasets containing the trends and competitive information. The *Crush* datafile also maintains notes and information necessary to load the linked files that users can attach to *Crush* data objects. See the sidebar "*Crush*: Inside Out" (opposite page) for a closer look inside *Crush*.

HOT Web Site

Realizing that there was no clearinghouse for business information on the Internet, HOT decided to move in by creating <http://www.hot.sf.ca.us>. "The good news is that anybody can put something up on the Web, and the bad news is that they do," says Davis, making a plea for Web sites that transcend what he calls "stupid Web tricks."

Their research revealed that 90% of business use on the Internet was for retrieving competitive information. Therefore the HOT site gives product information, resources for datasets, an online walkthrough of *Crush* screens, and the ability to order the product. Industry-specific datasets represent the information portion of *Crush*, focusing on trends combined with users' knowledge, targeted expertise, and a list of competitors.

In the company's original vision, HOT's marketers considered whether or not to sign on with CompuServe or some other commercial service. Ironically *Crush*'s delayed development time actually enhanced the richness of the final product, enabling the developers to incorporate complementary Internet resources. The idea is to incite consumers to take action outside of the computer into the real world. HOT's Web site has already received more than 75,000 hits.

HOT worked closely with HeyerTech to develop the site, which is maintained by five HOT staffers. As we went to press, visitors to HOT's site could use the Internet to request more information. In the future, more transactions will happen on the Internet.

"The issue of commerce is a complex one, and it's not merely an issue of technology," says Jonathan Fox, HOT's manager of new business development. "When we do begin downloading information and so on, we'll probably work with offline billing and a password. I know that's what we'll definitely do in the short term until there is secure technology and there's comfort in that use."

By working closely with their customers, HOT created a site that addressed the needs of their market. Davis suggests, "Ask yourself, is there a takeaway for my readers? Who are you building the product for? Then engage their suggestions."

In fact, by the time you read this, you'll also find the HOT Consultants Network, a searchable database of member business consultants for hire nationwide. This idea was suggested by a customer.

projects' source movies that we use to integrate into. I then make a copy of the project at build time and run the ResolveCastNames script. Internally, we refer to this version as "turbo."

The ResolveCastNames script looks like this:

```
on ResolveCastNames

    set the itemDelimiter to "="

    repeat with i = 1 to the number of castMembers
        if the castType of cast i = #script then

            set scrTxt = the scriptText of cast i
            set changeIT = FALSE

            repeat with j = 1 to the number of lines of scrTxt

                if line j of scrTxt contains "the number of cast" then
                    if not(line j of scrTxt contains "repeat with") then
                        set LHS = item 1 of line j of scrTxt

                        set castNum = EMPTY

                        if string(item 2 of line j of scrTxt) <> EMPTY then

                            put "set castNum = " & item 2 of line j of scrTxt into foo

                            do foo

                            if castNum = -1 then

                                put "bogus castnum" & "scriptNum=" & i && line j of scrTxt

                            else

                                set LHS = LHS && "=" && castNum

                                put LHS into line j of scrTxt

                                set changeIT = TRUE
                            end if
                        end if

                        end if -- does not contain repeat with
                    end if -- contains number of cast

                end repeat

            if (changeIT) then

                set the scriptText of cast i = scrTxt

            end if

        end if
    end repeat

    set the itemDelimiter to ","

end ResolveCastNames
```

Reports are printed using the PrintOmatic XObject licensed from Electronic Ink. The Windows version of the cast builder was licensed from Oasis Software in New Mexico. All other XObjects are custom coded.

Crush XObjects

For every XObject used in *Crush* there is a Lingo parent script whose sole purpose is to provide a layer between the actual calls to the XObject and the caller. This allows the definition of the API for each XObject and provides a way to deal with differences in the calling interface between the Mac and Windows versions. Additionally, a Lingo property is used to store each instance of an XObject.

Example of an Xobject "wrapper" script:

```
global ON_PC                -- TRUE if running on Windows machine

property pXObjInst

on birth me

    set pXObjInst = TEXTXOBJ(mNew)
    if not objectP(pXObjInst) then
        alert "Unable to instantiate TEXTXOBJ"
    end if

end birth

on hmDispose me
    if objectP(pXObjInst) then
        pXObjInst(mDispose)
    end if
end hmDispose

on hmSetText me, meTxt
    if objectP(pXObjInst) then
        pXObjInst(mSetText, meTxt)
    end if
end hmSetText
```


Director's built-in alert message supports only a one-button alert dialog, so I wrote an AlertMessage XObject to be able to display a SAVE CHANGES dialog, for example.

The Text XObject is designed to overcome the limitations of Director's built-in text fields. For example, to convert text into bitmaps on the fly, I needed text fields that would scroll automatically and without a scroll bar.

Since Director supports only 48 sprite channels, I needed to create cast members on the fly based on a user-selected element. In the "Competitive Summary" section of *Crush*, I would have needed more than 150 sprite channels. By using the CastBuilder XObject, I have virtual channels that we can slide in and out of Director's 48.

In the Positioning Graph section of *Crush*, I needed to display text rotated 90° counter-clockwise. Since there is no way in Director to create this, I implemented drawing the text into an offscreen memory buffer and rotating the bitmap. This worked out very well and resulted in very legible labeling of the vertical text.

XObject Open DA Mac is written for the Mac version to open desk accessories in the Apple Menu.

The LinkFile XObject allows *Crush* to open and launch documents and other applications. Future versions of *Crush* will enable users to build a wealth of valuable competitive information by linking URLs from the World Wide Web and sharing *Crush* data with other members of their team. A networked version of *Crush* is also planned that will allow members of a marketing or product launch team to collaborate and share their company's *Crush* assets. 

crush

Marketing


Crush is being sold via direct mail, telemarketing, cross-promotional advertising, response ads, and direct marketing to business organizations — not multimedia organizations. HOT is also targeting tradeshow and conferences that service the business and marketing community. So far, their plan seems to be working. At one conference, more than 40% of the attendees purchased the title. Sales have exceeded expectations. In 1996, HOT will take *Crush* to computer-technology related shows such as Macworld, PC Expo, and Comdex.

"If people see it, they love it. The trick is to get *Crush* in people's hands," says Davis. Apparently 75% of those who ask for information about *Crush* on the Internet actually purchase it.

In light of the sluggish sales of most other CD-ROMs on the market, it would seem that HOT knows something others don't. "It's a constant marketing effort," Davis explains. "Our practice is to build the customer into the product from the beginning. We talk to them, listen to their needs, what their customers ask for, and what they look for in a product." HOT has a marketing team of seven people and a sales force of seven.

To determine the price of *Crush*, HOT conducted a direct mail test comprising three price points (\$199, \$349, and \$499) sent to three lists of people. Surprisingly, the highest price tag proved to be the most appealing, perhaps based on the perceived value it carried. The product has an introductory price of \$499.

Distribution extends worldwide, and HOT is handling that entire task themselves. Currently, *Crush* is available only in English, but Spanish, French, and Japanese versions may soon be in the works.

The strength of the content and support for *Crush*'s original vision sustained HOT's dedication to seeing the product to completion. What's more, the resulting title is groundbreaking, poised for success, and likely to inspire a whole new genre of productivity tools. As vivid studios creative director Nathan Shedroff puts it, "I think there is a huge market for electronic workbooks that not only help you do valuable work but train you in new methods along the way." 

InterActivity contributing editor Ilyse Rimalovski reports on all types of interactive media and is an interactive copywriter creating Internet experiences. Send email to interactivity@mfi.com.

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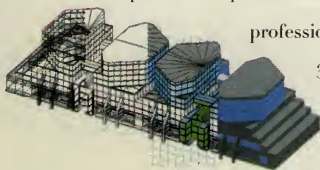
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AN OVERVIEW OF APPLE'S



Virtual reality, if you buy the Hollywood definition, is the Holodeck of the U.S.S. Enterprise. Walk into a room and your wildest fantasies appear before your eyes, more real than real. Unfortunately, what's real in Star Trek is a long way from the reality of virtual reality in the mid-1990s, **by** **DOMINIC MILANO** where it takes thousands of man-years and truly muscle-bound computers to crank out the zillions of heavily textured polygons needed to simulate real or imagined environments that can be explored in real time by users wearing Eyephones, Datagloves,





ime vr

V I R T U A L R E A L I T Y T O O L S



and all the other accoutrements associated with VR. ■ Apple's QuickTime VR technology allows developers to create spatial environments that end users can browse in real time using nothing more than a basic mouse-equipped Mac or Windows system. No headgear, no highend graphics hardware, no gazillion polygon worlds to build. A QuickTime VR scene can be created from 35mm photographs, doesn't require an advanced degree in world building, and can be used to demo any thing from architectural structures to clothing lines. ■ At least that's what the literature and press releases claim. We thought we'd peel back some



of the hype, check out what it's really like to develop QuickTime VR scenes, and answer a few basic questions along the way. What kind of capabilities does QTVR provide? What tools are required? Where can you get them? How much will they cost you? How long will a typical project take to put together? What land mines await and how can you avoid stepping on them? What are some of the more creative applications and how are they being created?

What It Am

A QuickTime VR *scene* is made up of panoramic images that users can view in almost any direction, in real time. A scene might also contain hotspots that when clicked launch *navigable object movies*, which allow users to click on an item and examine it by turning it around on its horizontal and/or vertical axis. Object movies are best captured using a video camera (we'll tell you why and how in a bit), although you can use a still camera or generate objects with 3D modeling software.

A *panorama* is typically a full-blown 360° view but there's no law preventing you from doing partial, less than 360° views. Think of panoramas as seamless cylinders, not spheres (see Fig. 1), because QTVR doesn't allow you to look all the way straight up or down (just how far up or down you can go depends on what lens you use to take the photographs). QTVR panoramas can be generated in a variety of ways: using a 35mm SLR camera mounted on a special tripod rig (described on facing page), an actual panoramic camera, a video camera set to capture single-frame stills, or any 3D modeling package that supports a one-pixel slit-lens panoramic camera.

Each panorama in a scene is called a *node* because each panorama is photographed around a single point of rotation. A scene with one panoramic view is called a *single-node* scene. If you link multiple panoramas together (so users can navigate from node to node), you've got a *multi-node* scene. There's no limit

to the number of nodes you can link together or the number of hotspots you can build into a scene. In fact, the more closely spaced nodes you include, the smoother the illusion of seamless navigation from node to node.

Development Software

Can you just run out, grab your Pentax, stand in one spot, snap a bunch of images while spinning around, digitize them as PICT files, pour them into Premiere, and output a QTVR movie? No way. First, you'll need a suitably powerful Mac to develop on (the authoring tools don't currently support authoring on Windows machines). Then you'll have to buy development software from Apple and sign a licensing agreement for any titles you intend to sell that use QTVR. The software tools you'll need are MPW (Macintosh Programmers Workshop) Pro Version 3.4b2 and the QuickTime VR Authoring Tools Suite 1.0 (see page 43 for pricing, licensing, and contact info). The latter comes in either NTSC or PAL versions. The difference? Only the format of the instructional video that illustrates the panoramic photography process. Also required are ResEdit Version 2.1.1, Macromedia Director 4.0 or later, and HyperCard 2.2 or later. (QTVR will also run with any authoring tool that supports XCMDs, though the tools Apple sells do not supply APIs for anything other than HyperCard, Apple Media Tool 2.0, and Director.)

MPW Pro is a collection of programming software that includes MacApp, C and C++ compilers, several debuggers, and ResEdit. MPW acts as a shell for automating QTVR authoring and scene compositing. The Tools Suite includes Mac and Windows QTVR APIs, XCMDs and scripts for HyperCard and Director, a runtime QTVR player, QuickTime 2.0, a HyperCard-based scene editor, a hardware dongle for copy protection (pay attention to the instructions on how to install the dongle — it can be damaged if you plug it in while your computer is running), a disassembled sample project (great as a beginning tutorial), and assorted pre-named folders. Using the folders and following the suggested file naming conventions included in the documentation will make your life a lot easier, especially since authoring scripts make use of them and the er-

ror messages aren't exactly clear in pointing out what the real problem is. For example, mistyping a file name by forgetting a space or putting an extra one in brings up a NO PICT FILE FOUND message, which could send you on a wild goose chase for non-existent file format problems.

MPW and the Authoring Tools Suite are somewhat time-consuming but easy to install. You'll need at least 40MB of RAM in your machine and lots of hard disk space (so what else is new?). If you're developing on a Power Mac, be sure to install the system extension StdCLib for the PPC, but be ready to pull your hair out from time to time. The installation instructions that come with

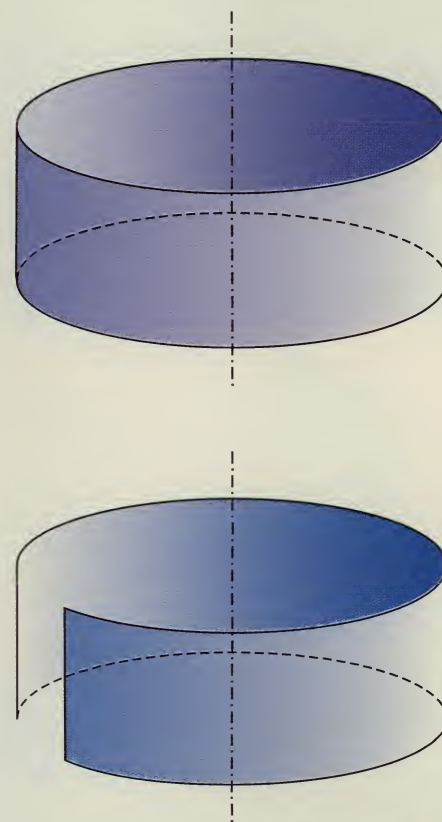
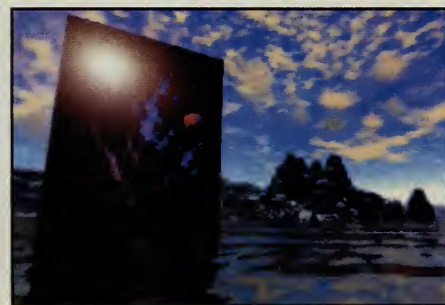
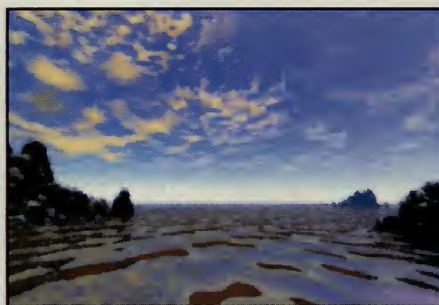
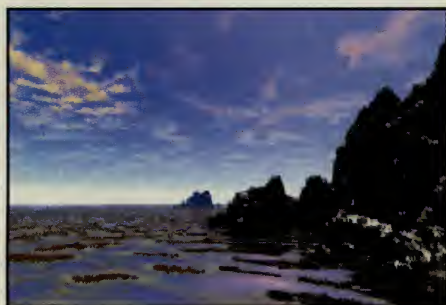


Figure 1. Think of QTVR panoramas as either full 360° (top) or partial (bottom) cylinders that center on a single node (represented here by the line running through their center). One of QTVR's limitations is that you can't look straight up or down.



Snapshots from a single-node QuickTime VR movie by Michael Radu of METECH in Saratoga, California. Radu used MetaTools' KPT Bryce to synthesize a virtual world. Step by step instructions on how Michael pulled it off can be found at <http://qtv1.quicktime.apple.com/metech/metech.html>.

MPW are not for the code challenged. There are versions of MPW included on the CD-ROM from various stages of prerelease, and the directions aren't all that clear. When you run the Apple script in the MPW Shell, as instructed, to duplicate files from the Latest Version and to install the PPC Native version of MPW, nothing seems to happen. And if you get the installation wrong (as I did), your system will crash constantly (as mine did) until you get it right.

However, the documentation supplied with the QuickTime VR Tools Suite is brilliant. It walks you through every step of the QTVR development process, doesn't assume too much about your knowledge base, and includes tons of illustrations, production tips, and shortcuts.

Photography

Panoramas and object movies can be captured with 35mm cameras or video cameras, or they can be generated with 3D modeling software. Things to consider with each approach:

Panoramas. You can use any 35mm camera to capture panoramas, but a rectilinear lens and a tripod are recommended (though not essential). The number of shots you'll have to take to cover a full 360° panorama depends on the size and orientation of your lens. For example, a 15mm rectilinear lens in portrait orientation requires one shot every 30°, so 12 shots give you a full 360° panorama. Apple suggests each shot overlap the last by at least 30%. We suggest you play it safe and aim for 50% overlap. The overlap needn't be exact, but the more consistent from shot to shot, the easier your life will be when you connect or "stitch" the images into a panorama.

We just said "any" 35mm camera, but to ensure image consistency from frame to frame, use a camera that allows you to manually adjust F-stops, exposure settings, and the like. Use a light meter too, because if there's any variation in color or contrast from image to image, the illusion of seamless navigation through your scene will go to hell in a handbasket. Any image processing software (e.g. Adobe Photoshop) can be used to touchup individual images or assembled panoramas.

There are special considerations for your panoramic tripod rig too. The tripod's function

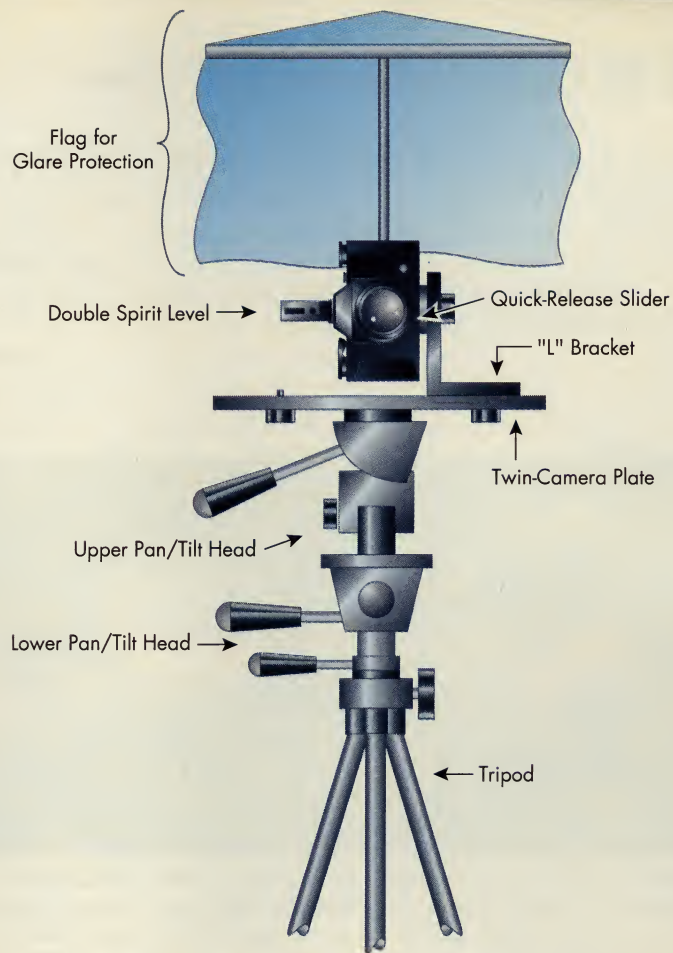
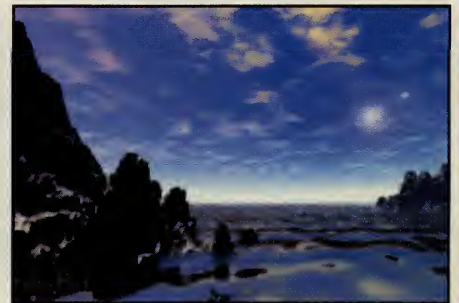
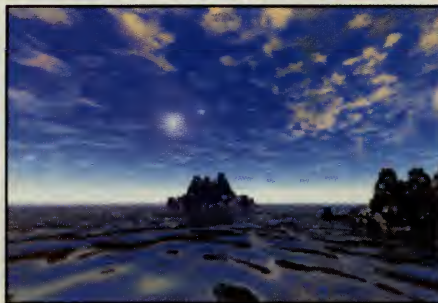


Figure 2. Your panoramic tripod rig needs to be level, and the camera must be centered on the focal point of the lens. The dual pan/tilt heads enable rotation on a level surface. Failure to keep the camera level or the lens centered will blow the panoramic illusion that you're standing in one place and turning 360°.

is to keep the camera level at all times and to keep the focal point of the lens centered in a precise manner. Failure in this regard will also blow away that seamless illusion. So, get yourself a tripod with built-in carpenter-style levels, put *two* pan-tilt heads on it in tandem, attach an L-bracket to the second pan-tilt head, and mount the camera to a slider plate attached to the bracket (see Fig. 2). This might sound extreme, but it's critical to get it right because this rig keeps the lens' focal point centered on your node while

you shoot through all 360°. The second pan/tilt head enables rotation on a level surface. Don't forget to put a level mounted on the camera's flash attachment bracket as shown in Fig. 2, and be sure to re-level the rig/camera for each and every node you shoot. Keeping the camera level is essential to painless post production.

You can use a video camera to capture stills for panoramas if it's equipped with a wide angle lens, but you're probably better off using a 35mm SLR for panoramas, since a 35mm lens is easier



IMERGY SENIOR ART DIRECTOR HOWARD BEAVER ON:

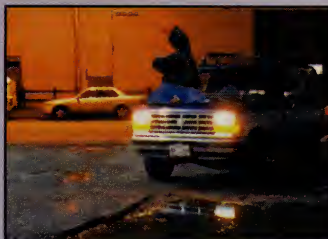
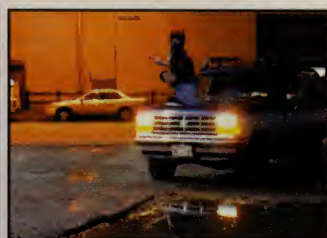
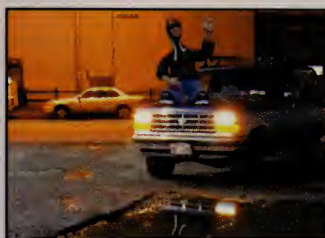
Howard Beaver only recently joined Imergy, the company that developed the first published use of QuickTime VR in a consumer title, Simon & Schuster Interactive's *Star Trek: The Next Generation Interactive Technical Manual*, *The Official Starfleet Virtual Tour*. Prior to Imergy, Beaver was senior art director at Thirteen•WNET's New Media Group where he developed QuickTime VR movies in Kenya for *Nature Interactive*, examples of which can be downloaded from Apple's QuickTime VR Web site (see the Resources sidebar on page 40).

Before we knew that Beaver was affiliated with the company that did the *Star Trek* title for Simon & Schuster, we were blown away by one of his demos — a single-node scene with three object movies. The scene, broken down here, is a graffiti-filled alley. The object movies are animated claymation rappers. The background music is hiphop with a laidback jazzy flavor.

"There's nothing mysterious about the animated object movies, because the Tools Suite supports them," explains Beaver. "It's simplest if you're shooting an object on a lazy susan. For every position, you shoot an animated loop



Howard Beaver worked with photographer Gabe Palacio on this stitched PICT file of *HipHop's* single-node panorama. The scene was shot in an empty lot in New York City using a Nikon N90 camera with an 18mm lens mounted vertically on a tripod with the 3Sixty mount produced by Peace River Studios for QTVR applications. A 35-70 lens in a horizontal format was used for the background images of the navigable object movies. Exposure was two seconds at f/8 on Kodak Pro 400MC (PMC) color negative film. Howard and Gabe wanted the colors to be vibrant and moody so they chose not to use corrective filters for the variety of light sources in the scene. The film was processed normally and scanned to Kodak PhotoCD. A Power Mac 8500 with 80 megs of RAM was used to stitch the panorama images.



The interesting thing about this rapper is that he not only dances, but his dancing is reflected in the water in front of the car. "That was sheer CoSA," says Beaver, referring to the compositing program now known as Adobe After Effects. "I just made a duplicate of the movie that was right-side up, flopped and inverted it to make a mirror image, created a file of it, and made a mask for that space."

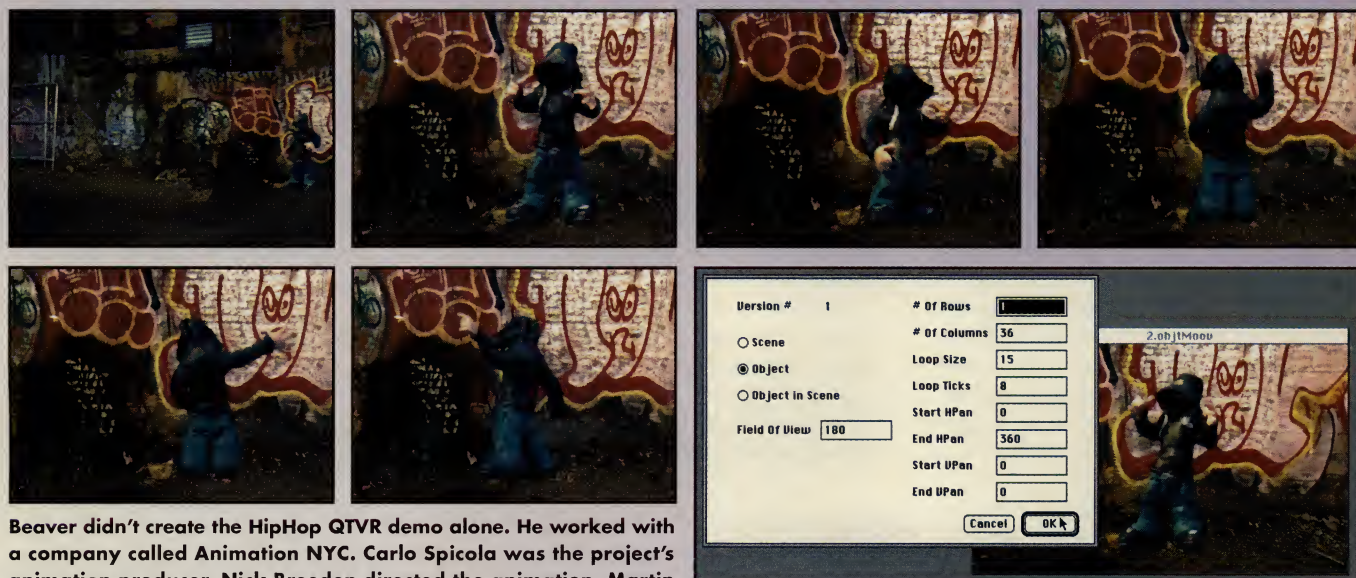


QTVR Claymation HipHop, The Star Trek Technical Manual, and Nature interactive

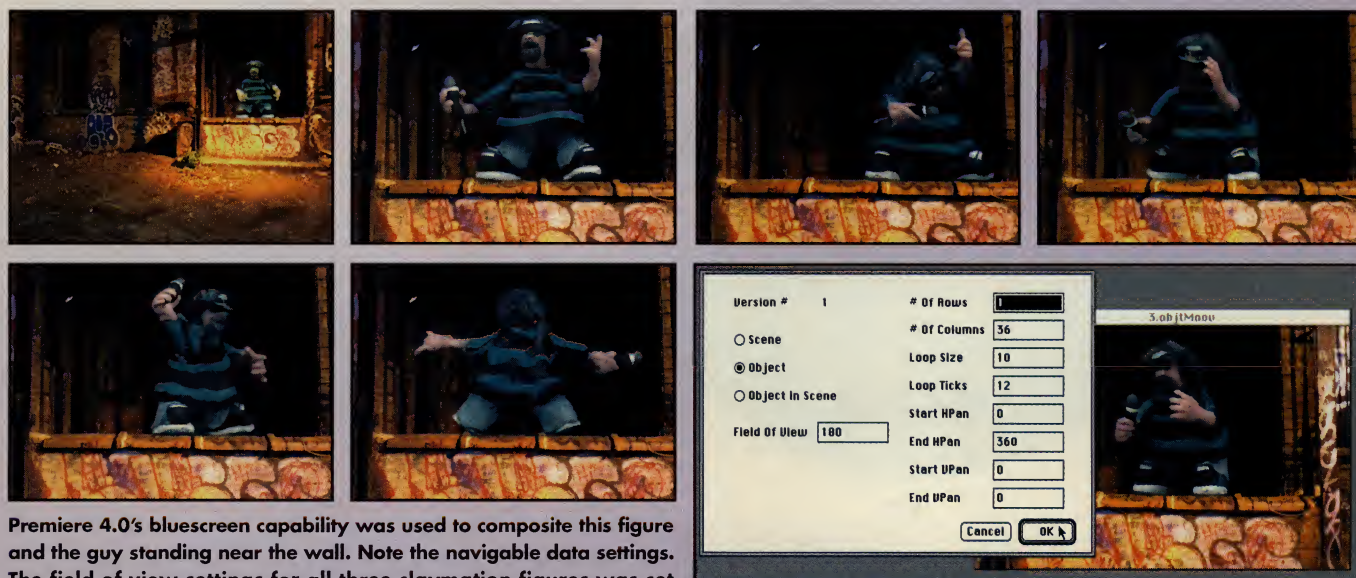
move. So instead of one shot for every 10°, you have maybe 10 frames every 10°. It's a simple question of ordering your frames as POSITION 1, FRAMES 1-12; POSITION 2, FRAMES 1-12; and so on. At each position, the movie just cycles through those loops." In fact, *The Star Trek Technical Manual* features object movies with animated elements to produce Tricorders with blinking lights and such.

"One of the problems we ran into making *HipHop* was image moire," Beaver continues. "To eliminate it, we used the animation codec instead of

Cinepak. I find the tools very flexible. When we were doing the work on *Nature* for WNET, we didn't work in the Scene Editor. Instead of making source PICTs and linking nodes and hotspots through the Scene Editor, we created a database of all the source PICTs, printed it out, and mapped out in pencil or pen to identify where the hotspots were going to be. The hotspots were created in Photoshop. Then we manually diced it and made single-node movies, created resource files, and linked them in Director. We got more flexibility having manual control in Lingo through XCMDs."



Beaver didn't create the HipHop QTVR demo alone. He worked with a company called Animation NYC. Carlo Spicola was the project's animation producer, Nick Breeden directed the animation, Martin Hernandez handled the character design and did animation along with Jason Rutherford, while Ron Olsen and David Kell Fox tackled the computer programming. Note the navigable data dialog box, which shows the size of the loop and the number of ticks. All three claymation figures required slightly different settings to get them to move in the desired way.



Premiere 4.0's bluescreen capability was used to composite this figure and the guy standing near the wall. Note the navigable data settings. The field of view settings for all three claymation figures was set to 180. The claymation was captured using a Sony DXC537A (3 2/3" CCD video camera, 750 lines of resolution) and a Canon KRS SX12 lens, input into a Radius VideoVision Telecast running on a Power Macintosh 8100/110 with 90MB RAM and captured on a Micropolis 4GB AV drive using Premiere 4.0's stop motion feature. A Macintosh 8100/110 with 50MB RAM was used for retouching, compositing, dicing, and authoring. Other software included Adobe Photoshop 3.0 for retouching the panorama; MPW and Apple's QuickTime VR Tools Suite; Macromedia SoundEdit 16 for audio file conversion; and Macromedia Director for authoring.

quicktime **vr**

to center and level than a video camera's lens. You'll also get better color saturation, resolution, and have access to better quality lenses.

If you do decide to use a video camera, you want to capture sort of still images. The easy way to do that is to point the camera in the desired direction and take a short burst of frames. Then dump single frames using a video capture system such as Radius' VideoVision Studio and save each frame as a PICT file. Like we said, use a 35mm camera. It's less hassle.

If you do your panoramic shots on 35mm film, have them developed in Kodak PhotoCD format and make sure they don't use auto exposure compensation in the process. PhotoCD gives you an easy way to get your hands on massive numbers of PICT files at relatively little expense. I mean, do you really want to scan 12 pictures per node and hope you get the settings just right on your scanner?

Object movies. Assuming you're not rendering your objects with a 3D program, you'll want to use that video camera and digitizer to capture object movies. Why? Because you can preview the images as you go — important because as the object changes its orientation to

the light source, you'll want to see and possibly adjust the way your shadows and glare fluctuate. You'll need a special rig for this step too, but this time you've got a couple options.

Object movies involve taking pictures on one or two planes, the x and/or y planes. That is, horizontal and/or vertical; er, HPAN and VPAN in QTVR speak. If all you want to allow your users to do is turn an object around on its horizontal axis, all you'll need for this step is a standard tripod to mount your video camera on and a lazy susan-style turntable to put your object on (see Fig. 3). Paint the platter black and put marks at 10° increments around its base. Apple recommends using a black background because it will drop out more consistently when you composite your object into the QTVR scene (something to do with the compression codec). Take as many or as few shots as you want, but one shot every 10° will give you seamless 360° motion. Move the turntable counterclockwise after each frame — the software needs to see counterclockwise images; there's a HyperCard stack included with the authoring tools that will number each image file automatically, so make sure you record them sequentially.

Trying to picture a rig that would allow you to get vertical images in 10° increments had us baffled until we stopped by the Apple R&D campus and saw the QuickTime VR team's custom computer-controlled motorized rig. Yum. It'll only set you back \$12,000. But a non-motorized

version should be easy to make (see Fig. 4). The tough part is getting images in which the object is evenly lit and the stuff holding it up is either invisible or easily painted out in postproduction with tools such as Adobe After Effects or Equilibrium DeBabelizer.

3D software-generated panoramas and object movies. More and more modeling packages support QTVR by including a panoramic camera object that outputs 360° views. Programs that include panoramic cameras include MetaTools KPT Bryce, Strata Studio Pro Blitz, and Lightscape LVS, an outrageously photorealistic 3D lighting simulation system (see accompanying panoramic strips). Virtually any 3D package can be used to output adjacent rendered im-

RESOURCES

► More detailed info on QuickTime VR outside of the documentation provided with the development tools can be had at Apple's Web site at: <http://qtvr.quicktime.apple.com/>

► A step-by-step tutorial of how to create a panorama in MetaTools Bryce can be found at: <http://qtvr3.quicktime.apple.com/metech/metech.html>

Object and Panoramic Camera Rigs

It's easy enough to build your own panoramic tripod rig from commercial parts, but these companies offer various self-contained rigs for shooting panoramas and/or object movies.

Kaidan

218 Anvil Dr.
Feasterville, PA 19053
215.364.1778
215.322.4186 FAX
kaidan@aol.com
Reader Service # 150

Peace River Studios

Nine Montague St.
Cambridge, MA 02139
617.491.6262
Reader Service # 151

VR ToolWorks

Box 2425
Cupertino, CA 95014
408.486.9595
VRToolwork@aol.com
Reader Service # 152

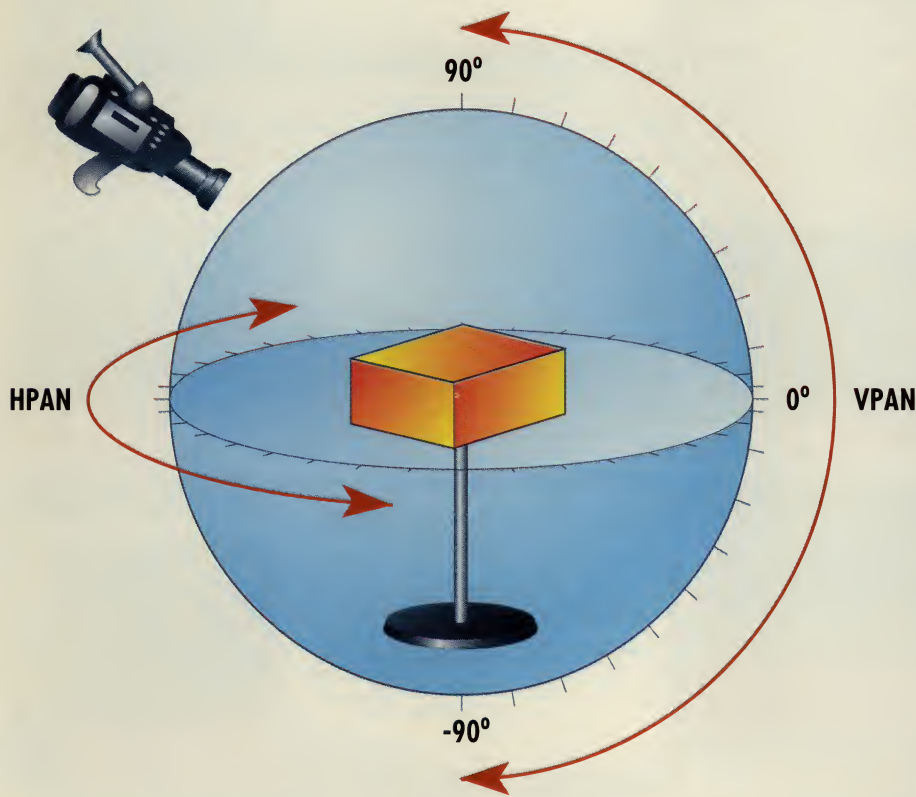


Figure 3. Object movies can be shot on one or two planes: the horizontal (HPAN) and/or vertical (VPAN) planes. Note that in practice, the Tools Suite wants to see HPAN images in the order they were taken, progressing in a counterclockwise direction. Use a video camera to capture still images every 10°.

If you're really feeling wimpy and want someone else to do the work for you, there are a number of service bureaus listed on Apple's Web site.

ages that simulate the steps described above for using a real camera. Similarly, object movies can be generated by any off-the-shelf 3D app by rendering images of objects every 10° on both the horizontal and vertical planes.

The Authoring Process

Before you get to the programming phase or even the point where you're ready to take pictures, you need to do your preproduction. Map out your scenes, mark where your nodes will be (see Fig. 5), figure out your naming conventions (again, stick to the techniques Apple suggests unless you're savvy enough to rewrite their scripts — not a tall order even for nonprogrammers, but why make your life more difficult than it already is).

When you get on location, you'll need various supplies to mark where you want your nodes to be (such as a tape measure and markers that won't be visible in the photograph to mark each node location). Lighting is the most critical aspect of getting your images to appear seamless, but every situation is different, so you're on your own in this department. By the way, taking images of outdoor scenes in which people are present yields interesting effects when they move around.

After planning, capture your images. Again, take great care to label your assets at each step of the way. Mark each roll of film after it's exposed. Use a clapboard (you know, Room 23, Node 4, blah blah blah) or something less pretentious to I.D. each series of images so you're not left wondering what's what when you find yourself with hundreds of images on PhotoCD. If your project is ambitious or just large, setting up an asset management database wouldn't hurt.

Once you've got all your panoramas and object movies in hand, you're ready to start slicing and dicing. Well, actually *stitching* and *dicing*. Stitching is what the MPW scripts do to join and blend each PICT file into a seamless panorama. Usually it's either 192x624, 384x1248, or 768x2496 pixels and shows up in Photoshop as a 90° counterclockwise-rotated image. Custom sizes can be accommodated by getting down and dirty with the P2MV tool.

After MPW does its stitching thing, you might have to touch up visible seams. If you captured your panorama right, there won't be much work to be done. If you blew it badly enough — that is, the panorama looks torn or the resulting image looks like your younger sibling's first attempt to sew a quilt — you might want to go back and reshoot your pictures.

The MPW script for stitching controls things like the lens' field of view, rotation required, horizontal and vertical offsets for the overlaps between adjoining images, and like that. If you blew it just a little, you might be able to kludge a fix by changing the offset values or the search ranges that will adjust the stitching of adjoining pixels. There's also an interactive *Stitching* function that lets you nudge your PICT images

ERIC ZARAKOV & THE QTVR TEAM ON HISTORY, MISTAKES, & THE FUTURE

HISTORY

Team Leader Eric Zarakov: About two and a half years ago, I started working on a project with Imergy [see the sidebar on page 38] out of New York that was based on research Eric Chen, Gavin Miller, and Lance Williams had been doing for the past four or five years as part of Apple's Advanced Technology Group's graphics efforts. I was finishing up some work in electronic photography as a program director, saw the beginnings of QTVR, and was excited by it. That's when I agreed to make efforts to start commercializing it.

Ian Small, Michael Chen, and Richard Mander from the Human Interface Group had done the pioneering work on object movies. So I brought them together with Gavin, Lance, and Ted Casey.

After about six months the technology was showing promise, but it wasn't running on low-end machines. At that point someone put Imergy in touch with us and we cut a deal that allowed them to be our first licensees.

That was precarious because at that time, panoramas only ran on a Quadra 840 with 40 megs of RAM — the PowerPC 9500 of the time. From their engineering estimates, they felt we could beat that performance, so we committed to having QTVR run on an LC3, which was a low-end 68020 machine.

So we engaged with Imergy and participated in the development of that title — Simon & Schuster's *The Star Trek Technical Manual* — so we'd know more about the development process. That is what drove the development of the development tools, so they're more generalized for first-time users.

The second showcase we did was *The Company Store*, the complete components for which are included in the Tools Suite. That entire project was outsourced, because we wanted to see what it would take for a real outside development team to produce QTVR projects. So we gave them the materials we'd developed and let them at it. It took them about three months to complete, at a cost of roughly \$30,000.

COMMON MISTAKES

Pete Falco: The most common mistake I see people make is inputting bad pathnames, putting in spaces, or not having spaces, whatever. Your filenames have to match the filenames you type into the scripts or you get error messages that don't necessarily tell you what's wrong.

It's also easy to get distorted panoramas that are stretched one way or another. Which is the result of entering the wrong vertical or horizontal pan range in their msnm script. They don't understand that if your images don't come close to where they should, the stitcher will stretch them anyway, and you'll get ridiculous results.

Memory allocation errors are also common. If you allocate all your memory to MPW, there's no room to load any of the shared libraries.

Michael Chen: A simple object movie will take 20 to 30 minutes to photograph. The most time-consuming aspect of it is the lighting. Something like the *Star Trek* stuff will take anywhere from a half day to two full days, mostly because of lighting considerations. But also because it's difficult to figure out how to support some objects in such a way that the support isn't visible.

You can bluescreen the support out, but when you're dealing with 500 frames, you want to minimize touchup. We just did a project for the Asian Art Museum in which we had to do an object movie of a copper pot. We had all kinds of problems with the bluescreen reflecting in the pot. Even when we got the background to drop out, the pot didn't look right in the scene because the reflections were wrong.

FUTURE DEVELOPMENTS

What's in store for QTVR 2.0? How does support for QuickTime movies within panoramas strike you? It's not fantasy. We've seen working demos in which the software adjusts the movie's shifting POV as you pan around a virtual space. Another feature in development will allow you to attach audio to said movies so that, for example, you'll be able to eavesdrop on conversations as you wander past them.

When will it be available? Says Zarakov, "We haven't set a release date. Our philosophy has been to make the announcement and ship shortly thereafter. Wishful thinking motivates great work." ☛

around on screen (keyboard commands allow you to move things up, down, left, right, and even rotate PICTs).

Dicing converts the stitched PICT images into QuickTime compressed images. Any codec

supported by QuickTime, including Cinepak and a variety of animation, video, and graphics compressors and proprietary codecs, can be used. The dicer automatically tags files with a .srcMooV extension. From there yet another

script generates a single-node movie relatively automatically. (You'll need to specify such things as file pathnames, hotspot files and specs, and final image size.)

Object movies don't need to be stitched or diced, just run through a simple parameter conversion script that takes the object from QuickTime to QuickTime VR format. A dialog box will ask you how many images you're processing in the horizontal and vertical field, loop size info (see the sidebar on Howard Beaver's work for cool QTVR object loop tricks on page 38), field of view, and so on.

Another script merges object hotspots with nodes. But before you can incorporate an object movie into your scene, you have to assign a hotspot to the object. This is accomplished by painting a solid color silhouette of whatever area you'd like to trigger an event (in this case, the object movie). Use Photoshop or your 8-bit paint program of choice, but make sure the color is one the system palette will recognize as unique, because anywhere that color appears on screen, the cursor will sense a hotspot that will launch your object movie. QTVR hotspots are pixel-accurate, so get your silhouette as accurate as you



Object movies support animation, and as you can see from these snap shots of Flapper (a QTVR object movie by Alan Snow of Domestic Funk Productions in Bath, England), not all QTVR need to be photographic. Download the movie from Apple's Web site and watch the wings flap as you can grab the bird and turn it horizontally.

can. The documentation walks you through the entire process, which is a little more involved than we have space to describe here.

The Tools Suite includes a HyperCard-based scene editor (Fig. 5) in which you build links between multiple nodes, position nodes, and link objects to nodes. The scene editor is really handy but not required for building scenes. If you're

a power programmer, the docs include all the details you need to create your own Multi-Node Resource file and MPW Build Worksheet.

Sound Stuff

"But what about audio?" the meager few whine. This is one area where the documentation falls flat. There's no mention anywhere

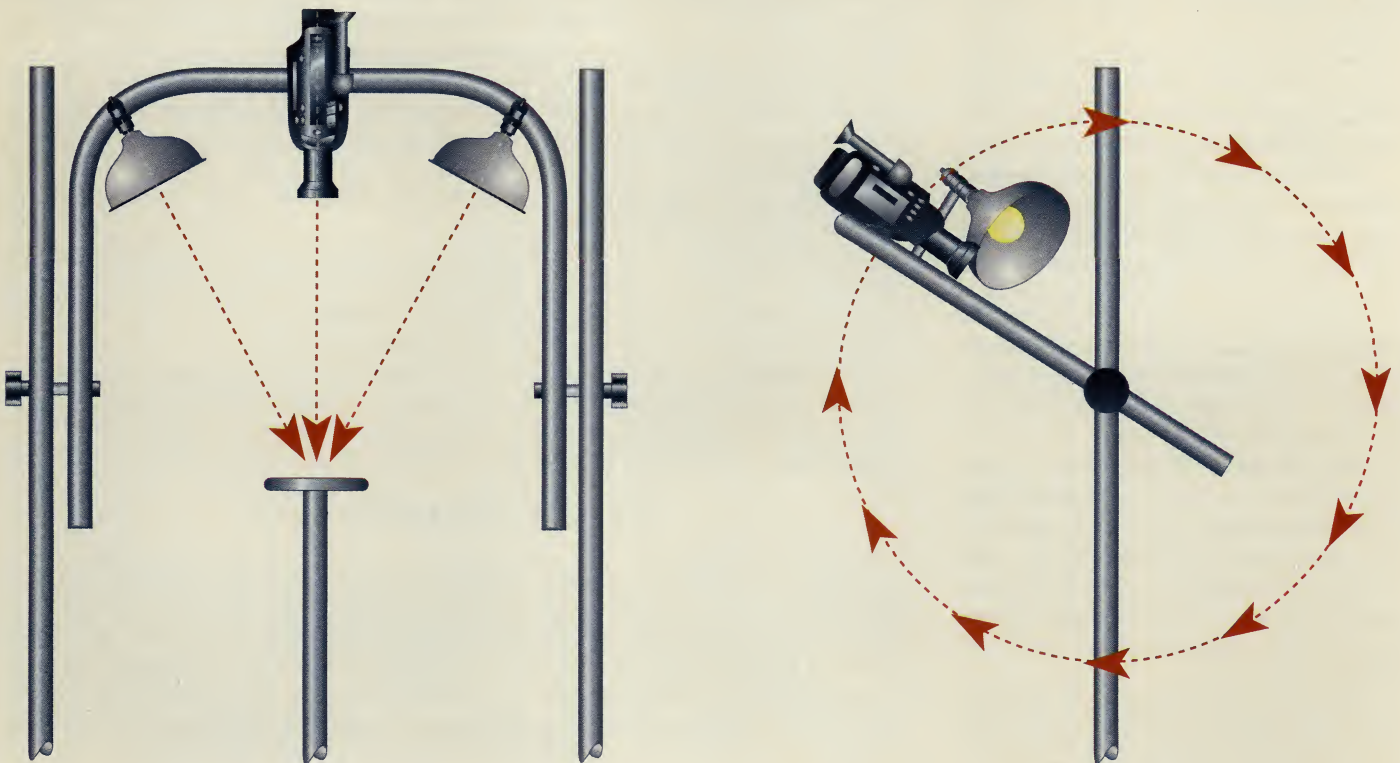


Figure 4. We had a hard time visualizing a rig that would allow you to take pictures of an object along both horizontal and vertical planes until we saw a rig like this one at Apple's R&D campus. The stand in the center is a lazy susan-style turntable. The video camera and lights are aligned to the same point (the center of the object stand), and the pipe that supports the camera and lights can rotate around the object (though no one has yet told us how an object can remain suspended as the camera swings under it). Object rigs are available from the vendors listed in the Resource list on page 40.

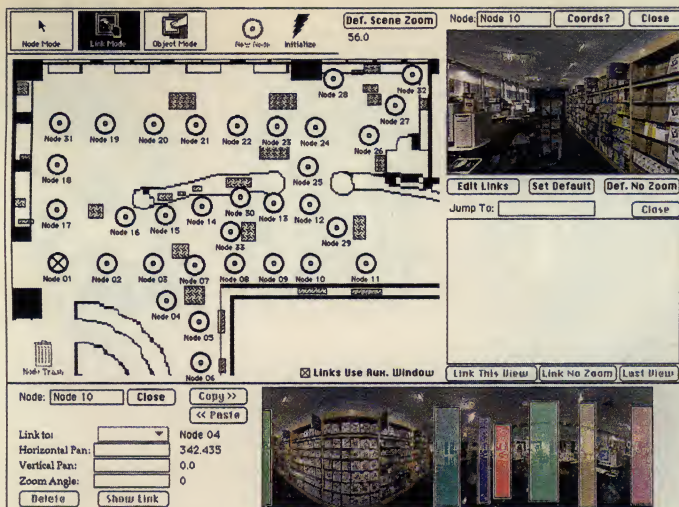


Figure 5.
The HyperCard-based Scene Editor allows you to link multiple nodes, position nodes, and link objects to nodes. Note the layout of the **Apple Company Store** (upper left) showing where each node was positioned and where hotspots are defined.

on how to attach audio to your movies. So how is it done? In your authoring tool (e.g. Director, etc.). If you're using Director and want to use hotspots to trigger object movies and specific audio events to go along with them, you'll have to use Lingo scripts to trigger the audio events.

Windows & File Sizes

We mentioned that you can't author QTVR scenes in Windows, but you can output Windows-compatible movies. All you have to do is select a Windows-compatible compressor during the authoring phase. And if you're curious, file sizes will vary, but expect a typical node to require from 500k to 700k.

The Final Frontier

QuickTime VR is a medium well worth the price of admission. If *The Star Trek Technical Manual* developed by Imergy for Simon & Schuster wasn't enough to convince you, consider: Automakers are using QTVR to demo car

interiors, fashion designers are producing object movies of models wearing their clothing (as you spin her around, the model moves, and customers get to see the outfit from whatever angle they're interested in), NBC used QTVR during its coverage of the O.J. Simpson trial to provide its commentators with instant interactive access to O.J.'s Brentwood estate as well as the murder scene (the scene had 26 nodes, which acted like 26 virtual cameras on call 24 hours a day), Alan Snow and Domestic Funk Productions are doing incredible things with animated object movies, travel agencies are using QTVR to let consumers experience hotel rooms . . . The list of creative applications is constantly evolving and the technology is easy to use and well documented. What more could you hope for? 🌐

Thanks to Eric Zarakov, Howard Beaver and Imergy, Jenne Holmgren, Gaby Schindler, and Mary DeVencenzi for their invaluable assistance in putting together this article.



Object movies don't have to be movies of static objects, as these snapshots from a GildaMarx Inc. fashion demo by Bob Maus' Global Presence prove. In this application, the user can view how an outfit looks from all directions, which beats the heck out of looking at a print catalog. As she is rotated, she strikes a different pose, though unlike Howard Beaver's claymation rappers, the model shown here is not otherwise animated. Download the full experience at <http://www.gildamarx.com/>.

PRICING, LICENSING, & CONTACT INFO

To order the QuickTime VR Authoring Tools Suite, contact:

APDA

Apple Computer
Box 319
Buffalo, NY 14207-0319
800.282.2732
800.637.0029 Canada
716.871.6555
716.871.6511 FAX
Internet APDA@applelink.apple.com
AOL APDAorder
CompuServe 76666,2405
Reader Service #154

Hours

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The prices below were current as of Dec. 15, 1995, and don't include shipping or sales tax. Check the QuickTime VR Web site at <http://qvr.quicktime.apple.com> for more current pricing and ordering info.

QuickTime VR Authoring Tools Suite v1.0 - PAL
standalone \$495

QuickTime VR Authoring Tools Suite v1.0 - PAL
and MPW Pro \$595

QuickTime VR Authoring Tools Suite v1.0 - NTSC
standalone \$495

QuickTime VR Authoring Tools Suite v1.0 - NTSC
and MPW Pro \$595

An 18-minute videotape is included with the authoring tools that provides an overview of photographing QuickTime VR scenes. It's also available separately in NTSC or PAL for \$29.95. It's a very good tutorial on how to prepare for a shoot and adjust your tripod rig for panoramic scenes. We highly recommend it.

School

The Apple Developer University offers a three-day class in QuickTime VR. It's well worth the \$900 price tag. For info call the Apple Developer's Hotline at 408.974.4897

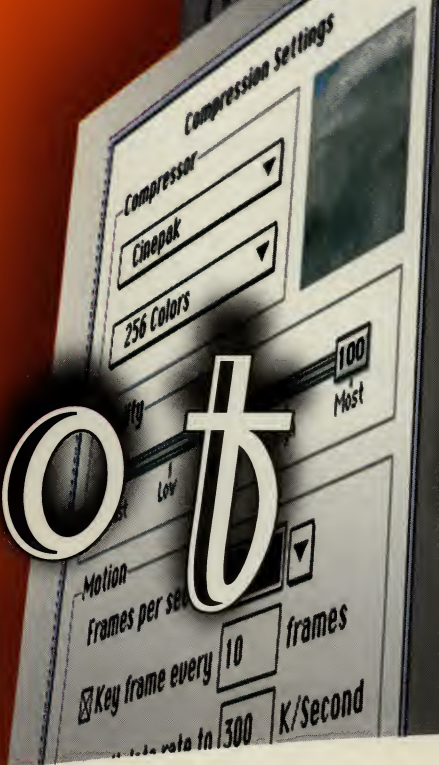
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*A developer's guide to the most powerful
graphics utility known to humankind*

DeBabelizer 1.6.5 for Macintosh is the single most powerful graphics utility known to humankind. Unfortunately, this creation of Equilibrium Technologies appears to be not entirely of this world, sporting an interface that some eminent scientists believe to have been designed by highly intelligent aliens. Consequently, many people find it more or less incomprehensible. ■ The program's complexity stems from the staggering array of things it can do to images and that its interface consists of nothing but what seems to be hundreds of dialog boxes and menu choices. In fact, aside from what the manual calls the Image Info window (labeled DeBABELIZER in Fig. 1, page 47), which is always open, the only time you see a regular window

by Richard Lainhart & Nick Kierstead

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is when an image is open and displayed on the screen. DeBabelizer is not an intuitive program in the sense that you can just launch it and start messing around. However, what it can do is so useful and powerful that it's worth putting up with the program's eccentricities.

If you already own DeBabelizer, it's likely that you've found numerous useful things to do with it. It's just as likely, though, that DeBabelizer can do a great deal more than you've managed to get it to do — you just haven't stumbled across all the dialogs yet. Our purpose here is to introduce the scope of its capabilities and then focus on a few operations that took a bit of head-scratching to figure out. Whether or not you're already a DeBabelizer user, you should come away with an appreciation of what it can do and what makes it an indispensable tool for interactive media developers.

A Tower With a View: DeBabelizer Overview

Essentially, DeBabelizer is an image processing program with batch processing and scripting capabilities. It includes simple paint tools, but it isn't really intended for painting or even retouching beyond relatively simple fixes — use Photoshop for that. Rather, it's the ultimate utility for mopping up after every other graphics program on the market.

It opens, saves, and converts every graphics file format you're likely to encounter, originating on almost any platform. It performs image processing functions such as cropping, scaling, and applying Photoshop-compatible filters. In addition, it converts color spaces (RGB and YUV) and dithers to lower bit depths with optimal results.

DeBabelizer's greatest strength is its ability to perform a series of operations on one or more files automatically. Suppose you've rendered 200 images on an SGI Indy that's part of a mixed-platform network. You need to bring the images into the Mac environment and prepare them for playback from CD-ROM. Specifically, you need to open each SGI-format image, scale it from 800x800 pixels to 640x640, crop it to 640x480, increase the brightness and contrast, dither it to an 8-bit system palette, and save it as a PICT file with a specific name and number. Before DeBabelizer, a scenario like this would have meant hours of hard labor in Photoshop.

With DeBabelizer, you can open one file over the network and perform the steps one by one, including adjusting INTENSITY and CONTRAST (in the PALETTE menu) and applying Photoshop filters. Having tested the steps to ensure you're getting what you need at the other end, you save them as a script either by adding them to a list or by recording the steps as you perform them. Then open all 200 SGI files into a *batch list*, have DeBabelizer apply the script to each file as you open it, and let the program grind out finished images automatically while you enjoy a well deserved rest. DeBabelizer can process literally thousands of files at a time this way.

DeBabelizer is also useful to animators and desktop video producers because it processes QuickTime and other animation and video formats as easily as single images. You can use it to apply a Photoshop filter to a video clip over time and even change the filter settings over time. It's also useful for removing,

interlacing, or reversing video fields and changing the aspect or pixel ratios of clips brought in from various digital video environments.

Bottom line: Despite the opaque interface, DeBabelizer is an essential tool for professionals working with digital still or moving graphics.

Games Without Frontiers: File Format Conversion

The list of file formats DeBabelizer supports is best described as enormous. More than 50 are supported, including almost all bitmapped files generated by applications running on the Macintosh, DOS/Windows, Silicon Graphics, Sun, Apple II, Amiga, Atari, and other platforms. Video and animation formats include QuickTime, Abekas, OMF, and a variety of run-length encoded files. In addition, DeBabelizer can open any file format supported by a Photoshop Acquire or Export plug-in. Finally, the program is equipped to open any raw data format and make intelligent guesses about how to process it and display an image. With this capability and a modicum of patience, you can open and manipulate almost any image file from any source.

Support for various file formats is provided by DeBabelizer's own plug-in architecture. The plug-ins are located in the DEBABELIZER folder within a folder labeled CUSTOM CODE. If DeBabelizer can't find the CUSTOM CODE folder, it won't be able to import or export any foreign file types, so be sure not to move it. Equilibrium frequently updates the plug-ins and adds support for new file types, all of which can be downloaded from their BBS.

Converting an image from one file type to another is simple as long as your image doesn't need to be resized or have its aspect ratio changed to conform to the new file type. Just open an image, select FILE > SAVE AS... and pick the desired format from the pop-up menu in the dialog. Bear in mind that the custom code for the new file type must be installed beforehand.

The United Colors of DeBabelizer: Palettes, CLUTs, and Super Palettes

Photorealistic images and fully shaded renderings can be represented fairly accurately on a computer screen with 24-bit color, which provides the ability to process up to 16.7 million colors simultaneously. When you display these kinds of images on a monitor set to show fewer colors, any original colors that aren't available on the new system are automatically remapped to the nearest available colors. On a 16-bit system (65,536 colors), this usually causes banding in the image. On an 8-bit color system (256 colors), you'll often see a cross-hatched coarsening of the image.

So why would you want to downsize those pristine 16- and 24-bit images? For one thing, the most common multimedia platforms are still 8-bit — generally the fewer the bits, the faster the graphics performance. Furthermore, 8-bit images occupy significantly less disk space than 16- or 24-bit images. Most captured video and 3D animation starts with at least 16-bit color, which often needs to be dithered down as well.

The replacement colors (that is, those to which missing colors are remapped) usually come from the computer's *system palette*, a color selection optimized for icons and other interface controls but ill-suited for simulating the subtle range of shades in a photo or rendering. One solution is to create a *custom palette*, sometimes called a Color Look Up Table (CLUT), an optimized selection of hues that better represents the colors in the image or video clip you want to display.

DeBabelizer excels at creating CLUTs and has the unique ability to create a *super palette* for a series of images or a video clip. A super palette is a CLUT optimized for more than one image or for

a series of video frames. With both still and moving pictures, it's a godsend to be able to generate custom palettes rather than risk having your images trashed by a system palette.

Making a custom palette for a single image is fairly straightforward. Open the image and select PALETTE > CHANGE PIXEL DEPTH.... Then set the number of bits and colors you want to dither down to, for instance 8 BITS = 256 COLORS DITHERED. (An alternative is PALETTE > REDUCE COLORS.... This option enables you to reduce to numbers of colors other than the usual multiples of 8, and to include a *required base palette*, a selection of colors and their palette locations required by some platforms.) Once the image has been processed, you'll see the palette appear. This palette will be attached to the image automatically when you save it as a 256-color (or whatever number of colors you specified in the dialog) PICT file. You can also save the palette independently for use with other images by choosing PALETTE > SAVE. (Palettes aren't saved independently, so don't expect to find any palette files on your desktop. DeBabelizer saves them as part of the PREFERENCES file.)

It Slices, It Dices: Image Processing Functions

DeBabelizer lets you crop, scale, flip, rotate, filter, and change the output resolution of any image. You can also remove or introduce video field interlacing and change the aspect ratio or pixel ratio of any image or clip.

To trim or crop an image, simply open it and draw a selection marquee in the image using the marquee tool, as in Fig. 1. You



Figure 1. DeBabelizer's user interface consists of the Image Info window (labeled DeBabelizer), which is always open.

can either do this by eye or double-click the marquee selection tool in the Image Info window and enter numbers to set an exact size. Then select EDIT > TRIM TO SELECTION. Marquee selections can be saved, or *stashed* as the DeBabelizer crew puts it, and applied to subsequent images.

Scaling, rotating, flipping, and re-aspecting are accomplished through the EDIT menu as well. Be aware that these operations yield different results depending on the order in which you perform them. Always test the results of a series of processes before committing them to a script.

Most Photoshop filters work in DeBabelizer, but first you need to install them. Select MISC. > PREFERENCES > PHOTOSHOP PLUG-INS LOCATION and pick your Photoshop plug-ins folder in the OPEN dialog. Now the filters will be available in the MISC. menu. This installation process is also necessary for Photoshop Acquire/Export filters.

A Macro Diet: Scripting

A script is a macro command that specifies a series of processes to be applied to an image. You create a script either by selecting menu items while the EDIT SCRIPT dialog is open or by recording mouse actions in real time. (Keep in mind the difference between a script list and a batch list. A script list is a series of processes to be applied to an image, while a batch list is a series of images that the program loads and processes according to the script.)

DeBabelizer stores scripts in the SYSTEM FOLDER's DeBABELIZER PREFERENCES file, not as separate files. If you want to transport a script from one copy of DeBabelizer to another, transport a copy of the first copy's PREFERENCES file. Be sure to back up the second copy's own PREFERENCES file before overwriting it so you don't lose any scripts that might be associated with it.

It's usually most efficient to make a script with the list method because it's easier to modify and debug. Here are the steps involved in creating the SGI-import script we discussed earlier:

1. Select New... from the SCRIPT menu. The EDIT SCRIPT dialog appears.

2. Select EDIT > SCALE > SPECIFY... to add this action to the script. Also select EDIT > DOCUMENT SIZE... and PALETTE > SET PALETTE & REMAP PIXELS.... You'll see all three selections in the EDIT SCRIPT dialog (Fig. 2).

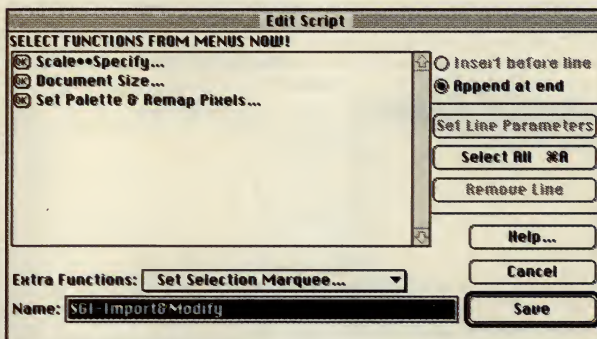


Figure 2. The EDIT SCRIPT dialog.

3. In the script list, any menu items that call dialog boxes will have a question mark next to them until you fill in the associated dialog. Double-click each item to open up its dialog box and enter appropriate settings. In this case, set SCALE to 640x640, DOCUMENT SIZE to 640x480, and PALETTE dithered to the Mac system palette. Then name and save the script (by clicking on the SAVE button). Now you can invoke it by selecting it from the SCRIPT menu.

Small is Beautiful: 8-Bit Cinepak with Custom Palettes

QuickTime 2.1 gave everyone's favorite system extension the ability to play movies compressed in 8-bit Cinepak format. Encoding in only eight bits reduces file sizes by roughly 2/3 compared with 24-bit Cinepak. Of course, far fewer colors are available to your video clips as a result. Unfortunately, there's no easy way to attach a custom palette to an 8-bit Cinepak file. In Adobe Premiere or After Effects, you can use the system palette to dither and reduce movies to eight bits. The result usually looks awful.

Again, DeBabelizer provides a solution — but don't expect it to be simple. By working your way through several obscure dialog boxes you can create a super palette for a QuickTime movie and

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then compress it to 8-bit Cinepak using the new palette, thus producing the best-looking 8-bit QuickTime clips possible in such a tiny size.

It's best to start with clips of the highest image quality you can manage. Capture at the highest data rate available, but not at the largest frame size. Instead, capture the frame size you expect to use in the end. This way you can avoid resizing, which degrades quality, and save disk space too. (You can resize the images in DeBabelizer if this isn't possible, but it's worth avoiding.) 3D animations should be saved as sequentially numbered PICTs or as QuickTime movies compressed using the 24-bit Animation codec at the Most quality setting.

1. Select **FILE > BATCH > SUPER PALETTE...** to open the **BATCH SUPER PALETTE** dialog. Click the **NEW...** button to open the dialog containing the batch list (Fig. 3) and append the clip to the list. If your source material is a series of numbered PICTs, open the folder containing them and click **APPEND ALL** to add them to the list. Then click **SAVE**. (If you're one of those people who never changes the default batch list name, say OK to delete the previous batch list.)

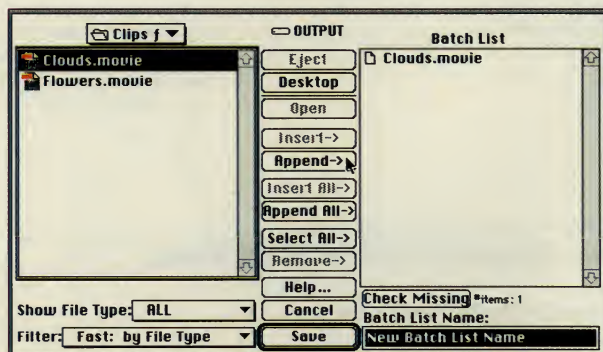


Figure 3. Creating the batch list for a super palette.

2. The **BATCH SUPERPALETTE** dialog, which has been obscured, is now ready for you to enter the settings as shown in Fig. 4.

Creating a super palette involves identifying the colors present in each frame in the clip, determining which colors appear most often, and assembling them into a new color table. Initialize the super palette to make sure only the current images are analyzed

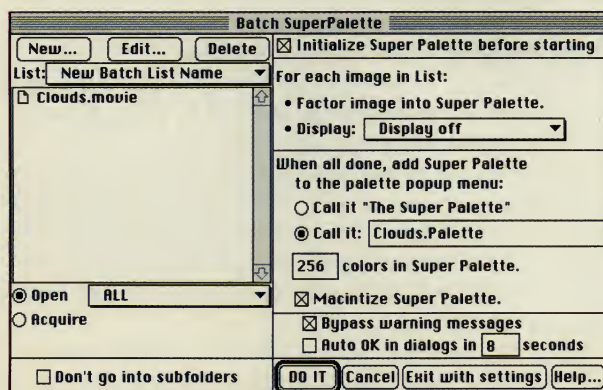


Figure 4. The **BATCH SUPERPALETTE** dialog settings.

and no colors from an earlier session find their way into the mix. Keep **DISPLAY** set to **OFF** so you don't have to look at each frame as it's being analyzed, which saves a lot of time if you're processing zillions of frames. The new super palette should be given a name so you can find it when it's time to compress the clip. You're making an 8-bit palette, so **COLORS** should be set to 256. "Macintizing" the super palette means that the first and last colors will be white and black respectively, which is the way the Macintosh likes it. When you're ready, click **Do It**.

3. The **QUICKTIME MOVIE OPEN** dialog now appears automatically. Set it as shown in Fig. 5. Make sure the box marked **SKIP THIS DIALOG** is checked — otherwise it will reappear for each frame in your clip, and DeBabelizer will wait for you to dismiss it. Click **OK** and DeBabelizer will go to it. On my average-speed Power Mac it took around 20 minutes to create the super palette for an eight-second, 320x240, 30fps clip.

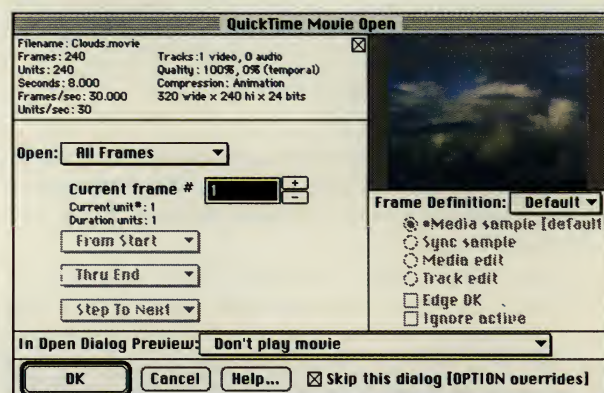


Figure 5. The **QUICKTIME MOVIE OPEN** dialog settings.

4. Next you'll see the **CREATE SUPER PALETTE** dialog (Fig. 6), which shows the colors in the palette and confirms the choices you've made up to this point. Click **CREATE IT**.

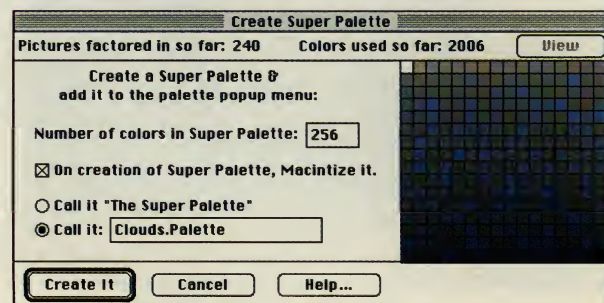


Figure 6. The **CREATE SUPER PALETTE** dialog.

5. Now that you've created the super palette, it's time to compress and dither the clip. Wouldn't it be nice to be able to generate the palette and compress the clip in one long batch? Don't even think about it. You'll need to bridge the gap between Steps 4 and 5 manually.

Select **FILE > BATCH > SAVE...** to open the **BATCH SAVE** dialog (Fig. 7). The name of your clip should still appear under the **LIST** field. (If not, click **NEW...** to open the **BATCH LIST** dialog and append your clip as in Step 1.) Set the **BATCH SAVE** dialog as shown. Click the button marked **AUTO NAMING OPTIONS...** to open the **AUTO Namer** dialog (Fig. 8) — lots of dialogs in this program, aren't there? This one lets you rename the clip or use the same name with an extension, as shown. Don't put a period in front of the extension; DeBabelizer will do that for you.

Click **OK** to get back to the **BATCH SAVE** dialog and decide where you want to save the compressed clip. To save to a different folder

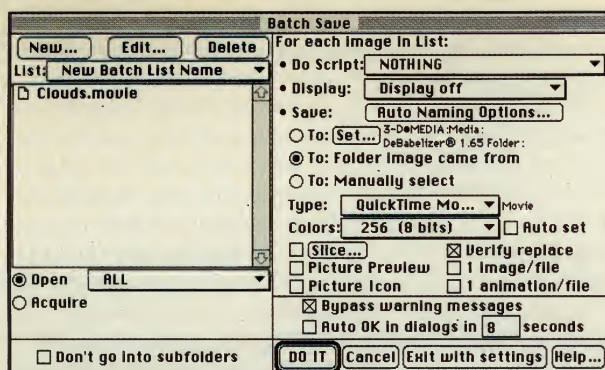


Figure 7. The BATCH SAVE dialog.

than the one in which the uncompressed clip resides, click SET..., which opens the standard SAVE dialog. Select QUICKTIME MOVIE from the SAVE TYPE pop-up menu. Set COLORS to 256 and click DO IT.

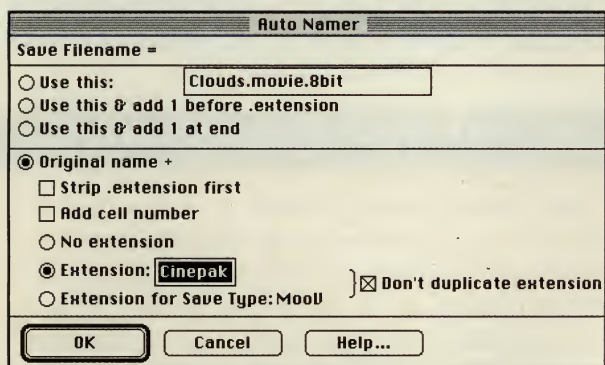


Figure 8. The AUTO Namer dialog.

6. The next dialog you should see is AUTO REMAP (Fig. 9). Select your super palette by name from the pop-up menu marked REMAP TO PALETTE. The dither settings you see here are the defaults. You can change them and set a background color in (guess what?) another dialog box. It's worth noting that setting DeBabelizer not to dither the background color keeps the background one solid color and makes it easier to key on that color (should you need to later). Again, check SKIP THIS DIALOG BOX to avoid having to dismiss the dialog once for each frame. Then you're ready to say OK.

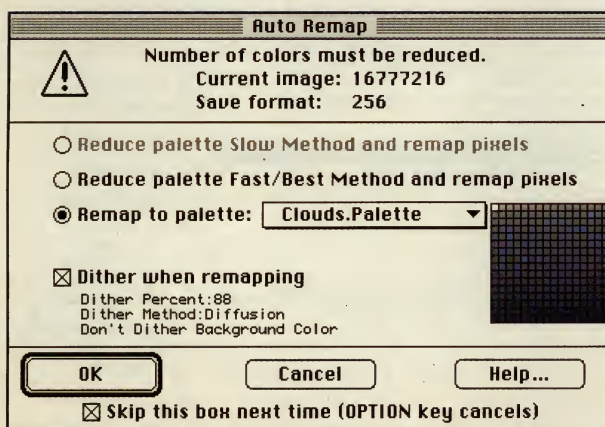


Figure 9. The AUTO REMAP dialog.

7. This calls the standard QuickTime COMPRESSION SETTINGS dialog (Fig. 10) with one important addition, the MORE... button. (Note that COMPRESSION SETTINGS allows you to change the frame rate. More on this in a moment.) Click MORE... and set the resulting

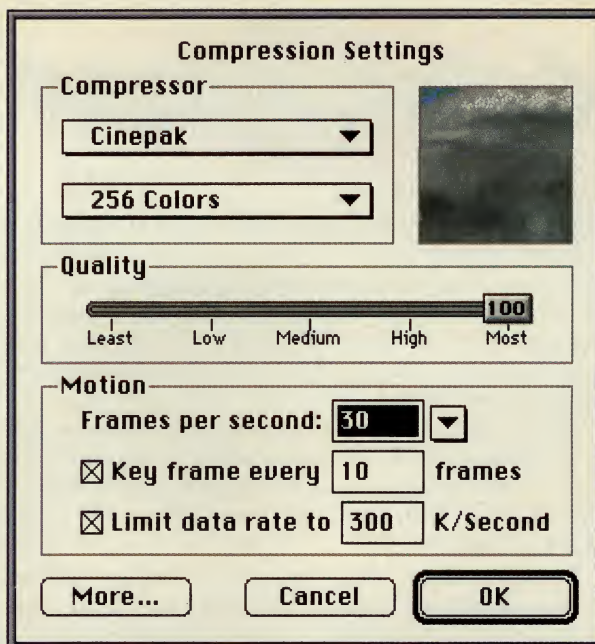


Figure 10. QuickTime's standard COMPRESSION SETTINGS dialog.

dialog as shown in Fig. 11, once again selecting the name of your custom palette in the pop-up menu. This ensures that your palette is associated with the movie when it's compressed. If you've changed the frame rate in COMPRESSION SETTINGS, don't check COPY DURATIONS OF FRAMES — the rate you set will be overridden. Click OK to return to COMPRESSION SETTINGS and set the desired frame rate, key frame rate, and data rate for your Cinepak movie, and click OK.

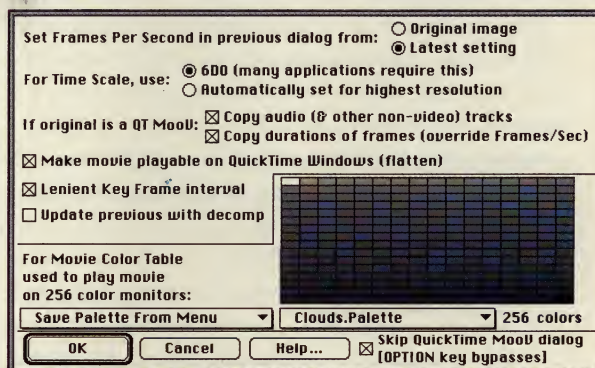


Figure 11. DeBabelizer's own compression settings.

Congratulations — you made it. Now it's Miller time, so take a moment to relax as DeBabelizer cooks your beautiful, tiny clip. Compressing our sample movie took 36 minutes.

Boppin' the Blues: Simulating Fullscreen QuickTime with Seamlessly Chromakeyed Video Sprites

An increasingly common technique in multimedia is *chromakeying*, or bluescreen, superimposition. Typically this involves shooting actors in front of a blue or green *chromakey backdrop* (also called a *bluescreen* or *greenscreen set*), digitizing the footage, then using a program such as Adobe After Effects to make the backdrop transparent. This is often referred to as *keying out* the background. Once you've done this, you can superimpose the actor against another background, real or virtual, and render a QuickTime movie to import into your authoring environment.

Chromakeying also can be used to overcome QuickTime's current

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limitation in window size. Many developers try to simulate a fullscreen presentation by rendering a 320x240 or smaller QuickTime movie with the bluescreen actor composited over a section of the background, importing the full-sized background as a still, and playing the QuickTime movie against the background. With care, it's possible to match the QuickTime window against the background fairly precisely.

Unfortunately, the background is usually an uncompressed 8-bit image, while the foreground video is compressed 16-bit color. The difference between the palettes associated with the two images often leaves a jumpy border around the QuickTime clip.

A good alternative is to use an interactive authoring system such as Macromedia Director, rather than a video application,

to do your chromakeying. Many authoring systems can treat a chromakeyed foreground as a sprite, superimposing it against any location in the background on the fly. That is, it isn't necessary to composite the footage ahead of time. There are two benefits to this. First, you can use the authoring system's controls for manipulating sprites, which broadens the range of visual possibilities. Second, you can use the same chromakeyed foreground against any number of backgrounds without needing to render separate clips. In the battle for space on a CD-ROM, this can make digital video a much more powerful ally.

But there's a catch — you knew there would be, didn't you? The problem is that the current version of Macromedia Director (4.0.4) allows you to key out only one color: pure white, RGB 255, 255, 255. Similar programs may offer other colors, but none enable you to key out more than one. Video applications, on the other hand, key out a range of hues to keep them from being fooled by slight variations in the background. Even if you've taken the trouble to shoot high-quality bluescreen footage at a cost of \$10,000 a day, between lighting variance, shadows, and current fluctuation during the digitization process, your perfect blue background is bound to include five to 10 shades of the target color.

Opening doors and windows with the Cranberries:

We concocted the bluescreen compositing techniques described above (see *Boppin' the Blues*, page 49) while creating chromakeyed digital video animations for the Cranberries' *doors and windows* (produced by M/B Interactive for Philips Media). This was a crossplatform project, released in a CD-i version as well as CD-ROMs for Macintosh and Windows. It was authored in Macromedia Director on the Macintosh and ported to the other platforms.

It was a high priority to maintain consistency among the various platforms. That is, playing the disc on CD-i needed to feel the same as playing it under Windows. Much of the experience consists of interacting with bluescreen band members in fullscreen rendered environments. On the original Macintosh development platform, these were QuickTime movies with audio. CD-i can't use QuickTime and has relatively little RAM for caching assets to memory, so it has a hard time playing any kind of fullscreen animation with audio. The data rate is also significantly lower, making it difficult to maintain the original video frame rates. The only way to recreate the QuickTime experience in CD-i was to use static backgrounds and small sprites composited in real time.

Furthermore, CD-i images are in CCIR-601 video format. This format has both a different aspect ratio (the relationship between image height and width) and a different pixel ratio than standard Mac graphics. In fact, CCIR pixels are rectangular rather than square, as they are on the Mac. Once we had created the clean-edged PICT files, it was necessary to resize them precisely and convert their file format to DYUV (digital video, for still backgrounds) or RL-7 (Run-Length 7, for animation). RL-7 uses a 128-color CLUT, so we had to do some fancy palette work and scripting to pull this off.

Equilibrium's CD-i export plug-ins are indispensable for DeBabelizer users developing for CD-i. They aren't included in the standard package and must be purchased separately.

Unfortunately, there's no precise recipe for preparing image files for CD-i. We arrived at solutions to our particular problems only after a lot of trial and error. Thus the information that follows should be regarded as guidelines, not rules.

After digitizing bluescreen video footage with audio as QuickTime movie clips, we brought the movies into Adobe After Effects. Then we placed the video clips in a composition of 768x560 pixels. We chose this size because it's exactly twice the size of the final CD-i image (384x280). This way we were able to crop the original files to 640x480 for Mac and PC while keeping it simple to rescale for CD-i. From After Effects we saved the images in PICT format. From this point on, we'll focus on the procedures necessary for developing the CD-i version.

Next we opened DeBabelizer and made a super palette for all the frames in our video. This was a 7-bit super palette of 128 colors. We had some 300 frames per clip to process, so this took a while. We saved the super palette and moved on through steps 3 and 4 of the procedure described earlier (under *Boppin' the Blues*).

The next process was to produce the script, which included all the items found in Fig. 16 (see page 53) plus a few additional steps specific to CD-i. The complete script is illustrated in Fig. S1.



Figure S1. A script to prepare image files for CD-i.

► **GUN CONTROL...** (added to the script list by selecting **PALETTE > GUN CONTROL...**) adjusts the color range of the images for CD-i playback. This refers to monitor color guns, by the way; NRA members can calm down. The dialog (Fig. S2) includes a preset for CD-i CCIR Normalize, which is what we selected.

Another source of variations in the background color is anti-aliasing, feathering, and blurring. These effects are introduced by just about any digital video process that involves resampling, including scaling and changing the aspect ratio. As a result, the edges between colors, for instance between your bluescreen background and the actor's tweed jacket, bleed into each other. When you bring this footage into an authoring program and select a key color, the pixels that blend background and foreground colors will remain opaque, causing a fringe or halo around the foreground image. (Note: In situations where the chromakey system *knocks out* a range of colors, as in broadcast and video applications, anti-aliasing is your friend. It creates problems only when you can key no more than a single color.)

What's needed, then, is a process that replaces the chromakey background with a single color found nowhere else in the footage — white, if you're a Director user — and removes any trace of anti-aliasing around the sprite's edges. DeBabelizer to the rescue.

1. After shooting your foreground images against a bluescreen, the first step is to digitize the footage and save it in QuickTime format. Import the QuickTime movie into a video processing ap-

plication such as Adobe After Effects and, using the chromakey functions, replace the original background with a solid color, white if you'll be using Director. This makes the background electronically pure, which saves trouble later. (You can do this in DeBabelizer, but we've found that After Effects provides a higher degree of control.) If you can, keep a border of three pixels or so around the foreground image. This way when you start to remove pixels from the edge, you won't eat into the image's outlines. Then save the video frames as numbered 24-bit PICT files. Make sure to disable anti-aliasing (in After Effects, this is done by setting the output quality to DRAFT mode). This step minimizes blending between foreground and background, though it doesn't eliminate it entirely.

2. Next, open DeBabelizer and create a super palette for the clip. Follow the procedure described earlier.

3. At this point you need to open the super palette and take a look at it. DeBabelizer doesn't seem to have a way to open a palette directly; it needs to be attached to an image. So open the first PICT in the series, choose PALETTE > SET PALETTE AND REMAP PIXELS..., select the palette you just created, and click OK. After

DEBABELIZER IN CROSSPLATFORM DEVELOPMENT FOR CD-ROM AND CD-I

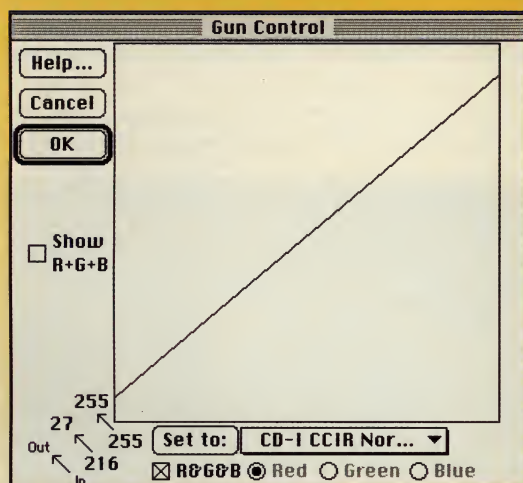


Figure S2. The Gun Control dialog.

► DOCUMENT SIZE... (added by selecting EDIT > DOCUMENT SIZE...) crops the image to the correct size for rescaling. This is necessary because of those nonsquare pixels we mentioned. The aspect ratio settings shown in Fig. S3 are the proper settings for CD-i.

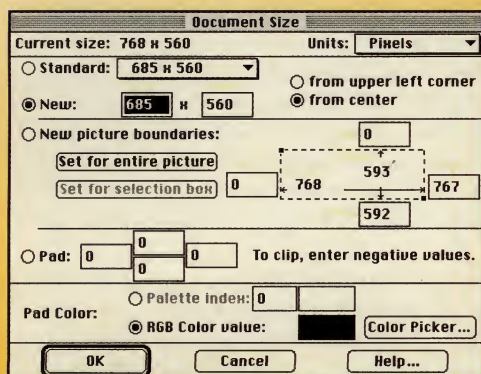


Figure S3. DOCUMENT SIZE dialog with settings for CD-i.

► SCALE••SPECIFY... (added by selecting EDIT > SCALE > SPECIFY...) scales the image disproportionately to compensate for CD-i's rectangular pixels. The settings shown in Fig. S4 are calculated for CD-i. After executing this step, the image will look squashed on the screen. But don't worry, it'll look right displayed on a CD-i screen.

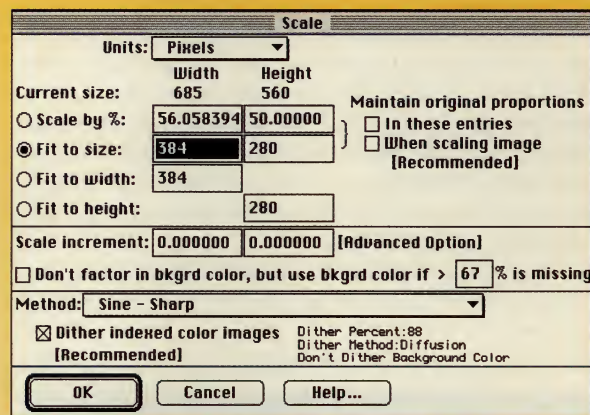


Figure S4. The SCALE dialog with settings for CD-i.

Having completed the script, we executed a batch save. The only difference between this operation and the batch save described earlier (see Small is Beautiful, page 47) is that we set it to run the script in Fig. S2 as each image was opened. In addition, the batch save was set to save each image in CD-i RL-7 format. Once everything was tweaked to our liking, we were able to process about 7,000 images more or less automatically, which saved us huge amounts of time.

And not only time. DeBabelizer enabled us to maintain a consistently high quality level throughout the thousands of images and multiple processes that hand labor wouldn't have allowed. When all is said and done, it's DeBabelizer's ability to maintain quality that we appreciate most.

debabelizer

dithering the image, DeBabelizer will display both the image and the palette (Fig. 12). Don't save the dithered image at this point — this is just a trick to get DeBabelizer to display the palette.

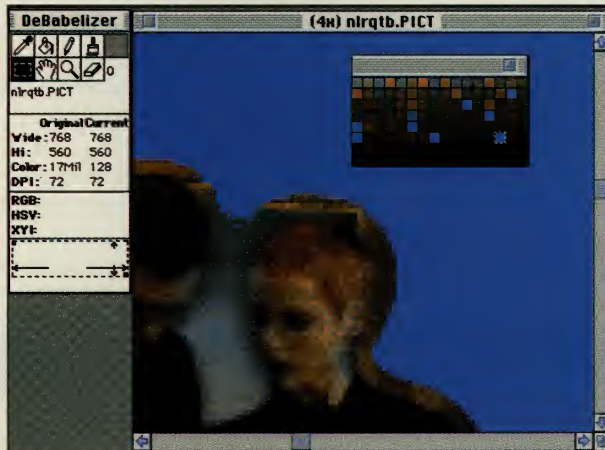


Figure 12. You can dither as a trick to get the palette to appear.

In the palette, you'll notice colors that are almost identical to the background color. These colors are found in the foreground image's edge — a tiny degree of anti-aliasing that seems to be unavoidable. It's necessary to convert them to exactly the same value as the background color to avoid a halo around the composited image. You shouldn't end up with too many of these colors — aim for fewer than 10. Remapping them reduces the number of colors available for the rest of the image, resulting in what we call the Barbie Effect: flat planes of color in faces. If you find you have more than 10 of them, you'll have to go all the way back to the After Effects stage and do a better job of removing the background shades and tightening the foreground key.

4. Zoom into the image (Fig. 13) with the magnifying tool. Note the shades of blue at the very edge. These are the pixels we'd like to eliminate.

Position the cursor on the blue background. This highlights the

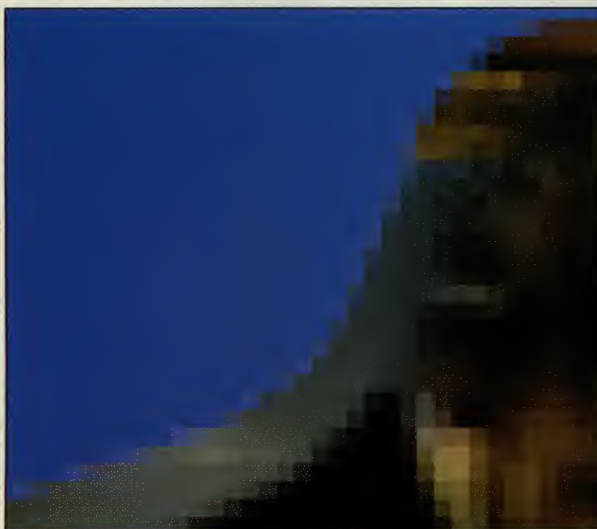


Figure 13. Zooming into the image with the magnifying tool.

background color in the palette window — note its position. Then select PALETTE > TRANSLATE... The dialog (Fig. 14) prompts you to select a new color with which to replace the old, so click on the background color. The dialog then prompts you to click on an old color, so click on a blue square similar to the background. Repeat as necessary until you've replaced all of them. (In the illustration, note that the dialog keeps track of which pixels are altered and to what value.)



Figure 14. The TRANSLATE dialog.

Be sure that BOTH is selected under TRANSLATE to ensure the pixels in the image are remapped along with the palette. Click OK and look at the results. This kind of edge (Fig. 15) yields the cleanest composite. If the results don't look right, you can always go back and translate more pixels or clear the translation and start over. When you're satisfied, select PALETTE > PALETTE > SAVE to replace the old version of the palette with the new. Finally, close the image without saving.

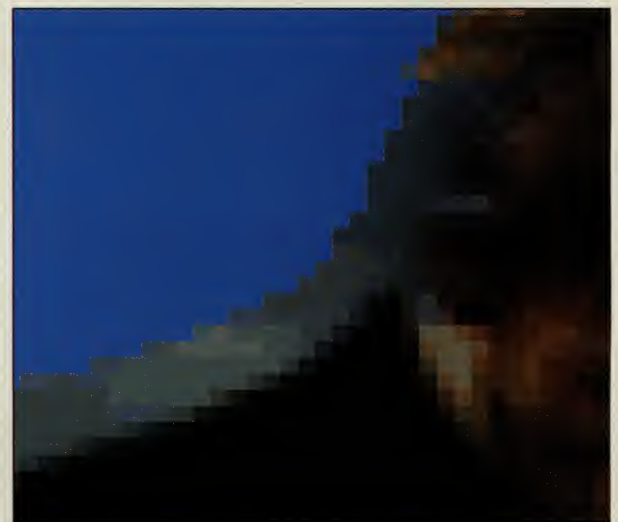


Figure 15. This kind of edge yields the cleanest composite.

5. You're nearly ready to batch process all the images in the sequence. First, though, you'll need to create a fairly complex script based on the method outlined earlier. Some of the particulars depend on your application (see sidebar). However, you'll definitely want to include some of the procedures that appear in the script illustrated in Fig. 16. Test the script and adjust it to your needs:

► **OPTIONS••DITHERING & BACKGROUND COLOR...** (added to the script by selecting PALETTE > OPTIONS > DITHERING & BACKGROUND COLOR...) calls a dialog (Fig. 17) that tells DeBabelizer how to dither the images. It's extremely important to check DON'T DITHER BACKGROUND COLOR and to pick the proper background color. Otherwise the background will be dithered and your work will amount to nothing.

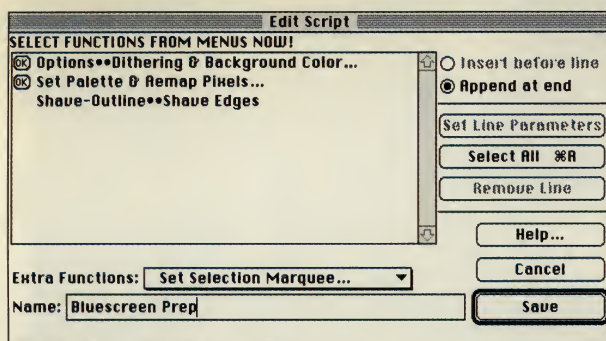


Figure 16. The EDIT SCRIPT dialog



Figure 17. DITHER OPTIONS & BACKGROUND COLOR dialog.

► SET PALETTE & REMAP PIXELS... (added by selecting PALETTE > SET PALETTE & REMAP PIXELS...) is where the reduction in bit depth takes place (Fig. 18). If you're doing any scaling or other modifications, do them before executing this step.

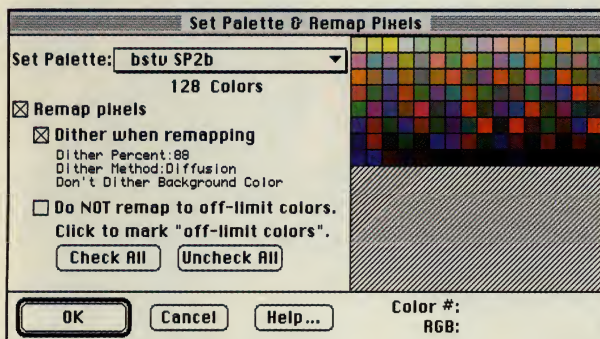


Figure 18. SET PALETTE & REMAP PIXELS dialog.

► SHAVE-OUTLINE**SHAPE EDGES (added by selecting PALETTE > SHAPE-OUTLINE > SHAPE EDGES) sharpens the edge further after the image has been dithered. It replaces pixels with the background color one row at a time, so you may need to apply it several times.

► Other processes worth considering include increasing brightness and contrast and running a Photoshop-compatible filter to sharpen the image before dithering. (These aren't included in the script illustrated here.)

6. Finally, create a batch save list for all your clips and let 'er rip. This may seem like a lot of effort, but trust us — it's nothing compared to doing it by hand in Photoshop.

DEBABELIZER 1.6.5

Description

Versatile graphics processing utility.

System Requirements

Macintosh Classic or better, System 6.0.7 or greater, 2MB RAM, 5.5MB on hard disk.

Features

Scripting of all functions; batch processing; crossplatform file format translation; compatibility with Acquire, Filter, and Export plug-ins for Adobe Photoshop; palette reduction, merging, swapping, remapping, and translation; super palette creation for optimal color across a series of dithered images, including QuickTime video clips; control over dithered colors and percentage of dither; chromakey superimposition; automated replacement of background colors with a single color.

File Support

Most file formats on Apple Macintosh, Apple II, DOS/Windows, Atari ST, Commodore 64, Commodore Amiga, Silicon Graphics, Sun, and other platforms.

Suggested Retail Price

\$399.

Contact

Equilibrium, 3 Harbor Dr., Ste. 111, Sausalito, CA 94965; vox 800.524.8651, 415.332.4343; fax 415.332.4433; Internet info@equil.com, <http://www.equilibrium.com>; BBS 415.332.6152. Reader Service #153

As I hope we've illustrated, using DeBabelizer is no day at the beach. The huge number of options, functions, and dialog boxes are enough to baffle even the most grizzled veteran of digital imaging. Of course, it's those very same options, functions, and dialogs that make the program so powerful.

The fact is, just about anything that might be done to an image in the course of production, DeBabelizer can do. The burden is on the user to recognize the range of possibilities, then poke around among the dialog boxes until you find what you're looking for. Unfortunately, that's the best prescription we can offer to would-be DeBabelizer power users. Rest assured, though, if you know what you want, you'll be able to get it. It may tax your patience to figure out how, but DeBabelizer will do it. 🐼

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how to PUT TOGETHER an INTERNET WEB SITE

INTRODUCTION TO JAVA

Java is the most important thing in the World Wide Web's short history. It unleashes the power of the client computer and makes possible applications not dreamed of just a few years ago. By creating a standard way to transmit functions, not just data, over network lines, the reliability and authority of the server database can be married to the power of the client computer. The Web has suddenly changed from an information publishing network to a universal database just a LAN-line away. ■ Let's review the fundamentals of how the Web works. A user sits down at a machine called a client and specifies a document. By the elegant system known as the Uniform Resource Locator (URL), the client machine sends a request up the wire for a single document to another machine called the server. The server responds by sending the requested document using a special protocol called Multimedia Internet

BY LARRY O'BRIEN

how to PUT TOGETHER an INTERNET WEB SITE

Mail Extensions (MIME). URLs go up the wire, MIME data types go down the wire. MIME data types are very simple packages for other types of files.

When the MIME data package reaches the client, it's interpreted by a special program called a browser. Browsers interpret a bunch of different MIME data types, but all browsers interpret a particular type called HyperText Markup Language (HTML). When we say that the browser interprets HTML, that means the browser looks at every character coming down the wire and decides what to do with it. Special HTML codes called tags specify formatting preferences (heading levels, emphasis, list items, and so forth) and hypertext jumps to other URLs. Those characters that are not bounded by tags are meant for display, in which case the browser calculates the font, style, linebreaks, and so on appropriate to the formatting preferences specified in the tags. This *client-side calculation* frees the server from dependence on the client's operating system or capabilities. This deferral to the client is what makes the Web so powerful. It makes the Web simultaneously system independent and a minimal consumer of bandwidth.

In addition to formatting and hypertext tags, HTML has additional tags to specify subdocuments that are MIME types other than HTML. When the browser comes upon such a tag, let's say an <IMAGE> tag, it creates a new document request for the server. In response the server sends a MIME package, but it isn't of the HTML datatype. It'll be of another MIME type, such as image/gif. As I said, browsers interpret various MIME data types, and those that know how to interpret GIFs will fire up a GIF interpreter to handle this new file. (By the way, this is why different browsers display images in different ways — some browsers have better image interpreters than others. This is especially true of JPEG image interpreters.)

Finally we get to the point of this article. As you read this, you should have your pick of two or three browsers that include an in-

terpreter for a new MIME data type for applications called Java. One browser is Netscape 2.x, the other is Hot Java, from the originators of Java, Sun Microsystems. Java is not a text format such as HTML, and it's not a graphics format such as GIF. It's a programming language, and an impressively able one at that. Now, as a site designer, you can create sites that are not just informative and visually pleasing, but functional as well.

What is an example of a functional site? Stock market sites with realtime price updates and technical analysis graphs. A word processing homepage that ensures your computer is always running the latest version of

The Web has suddenly changed from an information publishing network to a universal database just a LAN-line away.

the features you rely on and that you never even load the features you don't use. A page where support technicians analyze and troubleshoot your hardware problems from a thousand miles away. Games with a thousand people online simultaneously.

Less ambitiously, active pages can capture the attention of users with dynamic animation and sound, gather demographic information, and present the user with more sophisticated interface elements than those available with HTML. Forms, for instance, can be supplemented with multiple windows, menus, dialog boxes, and all the other elements of a modern graphical interface.

Java is not the only option for creating distributed programs on the World Wide Web, but it has several compelling advantages. First, any Web data standard must be supported at the client end by something — either an interpreter incorporated in the browser or configured as an external viewer. Since Java is rapidly gaining support from the browser community, it's likely that your site's users will be able to upgrade their browsers and execute your Java programs.

In early December, Microsoft flip-flopped and licensed Java, a testimony to Java's momentum, as Microsoft was well on the way toward an Internet strategy based on Visual Basic and OLE controls. Microsoft will probably get a Java-enabled version of their Internet Explorer browser into the market in 1996, but it's unlikely their Visual Basic or Visual C++ development tools can be quickly re-engineered to support Java development, so look for them to buy a company with a good screen painter and code generation tools (hmm... Corvallis is practically next door to Redmond, but La Jolla would certainly make a nice change from the rainy Northwest).

More important, the Java programming language appears to have been very well thought out. Although it was developed for Sun by David Gosling, Sun is working with other development tool manufacturers to create a Java development tools industry. In the PC space, the most important Java licensee is Borland, who turn out some of the finest compilers and visual development tools available. If Borland can integrate Java with their compiler back end, much less integrate it with their Delphi visual development environment, Java might become *the* language for client/server development.

What Is It About Java?

What are the characteristics of Java that make it so appealing? With tongue only slightly in cheek, the Java homepage at <http://www.javasoft.com/index.html> describes Java as "a simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded, dynamic, buzzword-compliant, general-purpose programming language."

The part about it being simple is a lie, but everything else is kosher. Java is simple only in comparison with C++, which is like saying K2 is short in comparison with Mt. Everest. As a matter of fact, Java borrows liberally from C++ syntax, so you can use the thousands of shelf-feet of C++ books to teach yourself the new language. The most important difference is that Java does not contain pointers, the powerful but dangerous raw memory addresses that make C and C++ suitable only for professionals willing to accept the consequences. Java also borrows concepts from

languages such as Eiffel, Objective C, and Cedar/Mesa.

The loss of pointers is not a crippling blow. Java's object system relies heavily on handles, which, like pointers, allow containment by reference. This means efficient data structures can be created easily. A doubly linked list of objects would look something like this:

```
public class DoublyLinkedList{
    /* Public interface */
    ...
    /* implementation */
    private Object item;
    private DoublyLinkedList prior;
    private DoublyLinkedList next;
}
```

Another reason programmers turn to pointers is for runtime function resolution. For an application to be flexible, extensions must be integrated with as little rework of existing code as possible. Imagine you were writing a Java online loan application program as a pilot project for a bank. For proof of concept, you might limit yourself to one type of loan (let's say car loans), but you know that if all goes well, you'll be adding mortgages, student loans, and so forth. You don't want code that looks like this:

```
String loanType = GetLoanType();
if ( loanType == "car loan" ) {
    DoCarLoan();
}
if ( loanType == "mortgage"){
    DoMortgage();
}
```

With this code, every time you add a new type of loan, you must change this code and retest it. And each time you change it, you'll increase the cyclomatic complexity of the function and must add a new test case for complete logical test coverage. In this type of situation, you want to decide at run time which function to call. Pointers are one way to do it, but Java uses object orientation's polymorphic function resolution.

With object orientation, the dispatch function would look something like this:

```
String loanType = GetLoanType();
Class loanClass = new Class();
loanClass = Class.forName(loanType);
AbstractLoanClass theLoan = loanClass.
    newInstance();
theLoan.Calculate();
```

This dispatch function has only one control path and therefore requires only a single test case for coverage. And you can add a new type of loan at any point without changing the source code.

The final common use of pointers is for system-level programming and meta-programming, in which pointers are used to get at the guts of the computer. Unfortunately, there are people in the world who use such capabilities to write damaging viruses. Java's memory allocation scheme makes such programs much harder to write. Additionally, all Java interpreters are supposed to do bytecode verification to protect against one of the most insidious virus techniques, which is to use a so-called *hostile compiler*.

The question of bytecode security raises one of the more common questions about Java: Is it interpreted or compiled? The an-

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parison with
Mt. Everest.**

swer is both. Java is a p-code system, which means that it's compiled for a virtual machine that is emulated at run time. Additionally, the door is open for just-in-time compilation on the target machine.

If you don't understand the last paragraph, here's the problem in a nutshell. Humans work well with symbolic notations, such as English and mathematical notation; computers work with a very limited set of instructions called *machine code*. Turning a human-readable form into a computer-executable form is time-consuming. The traditional viewpoint is that the translation must take place at one of

two possible points: when the programmer writes the program (compilation) or when the user runs the program (interpretation). The problem with compilation is that it makes writing the code very time-consuming, as you must code a little, compile it, test it, code a little more, and so forth. The problem with interpretation is that the translation step slows execution.

The use of p-code is a third way. A p-code system compiles the human-readable code into machine code for a make-believe computer with certain characteristics. The most important of these characteristics is that it's easy to translate the most common programming instructions (such as reading and writing to memory, jumping, and arithmetic) from the make-believe machine code into real machine code. The final translation and interpretation of the p-code happens at the time the program is run.

Yes, p-code is interpreted, but generally it has much less impact on performance than traditional interpretation. Since the p-code virtual machine has a much simpler architecture than a real chip, p-code is generally very small in comparison with a fully compiled application. In our modern world of multilevel caches and virtual memory, size optimization often has a greater impact on performance than machine code optimization. The last time I looked, for instance, Microsoft Excel used p-code extensively, and yet Excel is a performance-oriented program. It's too early to make sweeping statements about Java performance, but there are reasons to suspect that it will be good to excellent. Finally, the presumed reason for Borland's licensing of Java from Sun is to create a just-in-time compiler.

Right now, Java programming is the domain only of those comfortable developing from the command line. There are no visual programming environments, no screen painters, no browsers, no online function call references, and no CASE tools. In short, Java programming is a lot like C++ programming was seven years ago. As with C++, eventually there will be an explosion of excellent development tools and programming environments.

Java is the most important new development language since Visual Basic. It will change everything. ❧

ABOUT THE AUTHOR

Larry O'Brien is the conference chair of Web Development '96, editorial director of *Software Development* magazine, and technical director of ALT.net, a custom Web and CD-ROM development house. He can be reached at interactivity@mfi.com.

THE SHARPER IMAGE

HORIZONS TRUEMOTION-S VIDEO COMPRESSION FOR MAC & PC

B Y J O H N W O R T H I N G T O N

People sure get jaded fast. Not long ago, a small grainy QuickTime video playing off a CD-ROM was sure to impress people.

Now they want to know why it isn't bigger. Why is the picture so fuzzy? Why does it jerk around like that? Why doesn't it look like TV? Thus begins the never-ending search for better video compression algorithms.

The easiest solution is to add hardware. A little extra processing power can get your platform pumping out more bits at greater rates, making it practical to compress the data less drastically and thus maintain higher image quality. Of course, convincing prospective customers to buy extra hardware just to run your masterpiece is a tougher nut to crack.

TrueMotion-S, a video compression algorithm from Horizons Technology that integrates with QuickTime or Video For Windows, offers improved image quality without additional hardware. Using TrueMotion-S, you can compress video clips on a Mac or Windows (3.1, 95, or NT) and play the results on the Mac, Windows 3.1, Win95/NT (32-bit), 3DO, and Sega platforms. Future versions are planned for DEC Alpha and MIPS machines.

(You can download a demo version of TrueMotion-S, user tips, and some cool sample movies from Horizons' Web site at <http://www.horizons.com>.)

Getting Started

Both QuickTime and Video For Windows were designed to allow additional compression algorithms or *codecs*—for compression and decompression—to be added later. This way they can take advantage of new codecs as they're developed. When you install a new codec, all your video applications have access to it. An application such as Adobe Premiere calls QuickTime or Video For Windows when it's time to compress a frame of video, and QuickTime or Video For Windows passes the call to the codec.

This is exactly how TrueMotion-S integrates with your favorite video software. After you've installed it, TrueMotion-S shows up as an additional choice in the standard COMPRESSION SETTINGS dialog provided by QuickTime or Video For Windows (see Fig. 1). (While the illustrations that appear with this review depict

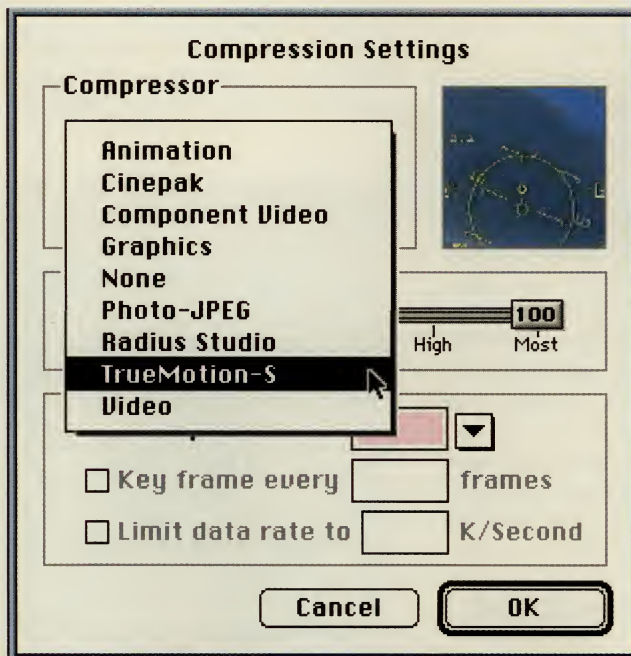


Figure 1. QuickTime's standard COMPRESSION SETTINGS dialog. Once you've installed it, TrueMotion-S appears in the Compressor pop-up menu.

a Mac-based system, the interface for TrueMotion-S is basically the same on a PC.)

Having selected TrueMotion-S in COMPRESSION SETTINGS, you use the QUALITY slider found in the same dialog to set the desired image quality. Generally, quality corresponds to the degree of compression. The MOST setting provides the best quality but the least compression; LEAST provides the lowest quality but the

greatest compression. Most codecs available for QuickTime or Video For Windows offer control of quality via the QUALITY slider only. With TrueMotion-S, values along the slider represent various presets, which are editable. (More about this later.)

Most codecs look pretty good with the quality slider set to Most. If your work accommodates the larger file sizes that result, you may



Figure 2. The results of applying TrueMotion-S presets. The upper left-hand image is uncompressed. Clockwise, the images have been compressed with QUALITY set to MOST, MEDIUM, and LEAST.

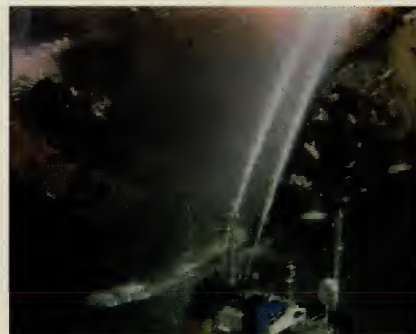
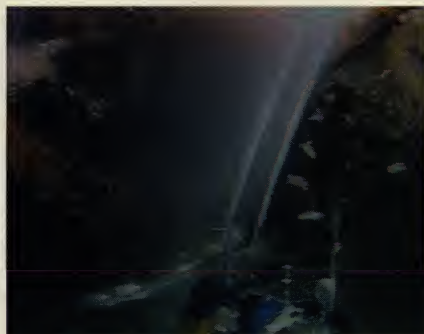
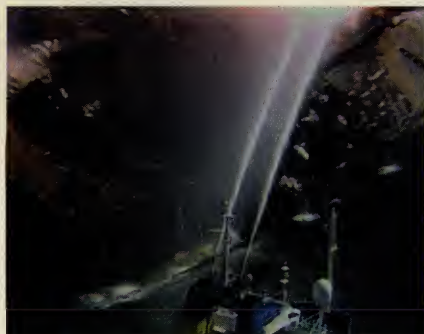


Figure 3. From left, an uncompressed image, the same image compressed with TrueMotion-S at LEAST quality, and compressed with Cinepak at LEAST quality. The TrueMotion-S image has less contrast and shows some banding around contours, while the Cinepak image is very blocky.

not have much reason to use TrueMotion-S. But if you're working on a CD-ROM, you'll probably be dealing with the low end of the quality scale. In this case, TrueMotion-S is well worth considering.

As you can see in Fig. 2, the position of the quality slider can make a difference. The upper left-hand image is the original. Going clockwise, the images are compressed at MOST, MEDIUM, and LEAST. At the lowest quality setting, the compressed image has significantly less contrast than the original. There also tends to be banding around the contours in the image (see Fig. 3).

With the same quality setting, Cinepak — which is what I assume most people use most often — doesn't reduce the contrast, but there is very noticeable blocking. Personally, I prefer the look of TrueMotion-S. (Incidentally, the new version of Indeo should give both TrueMotion-S and Cinepak a run for their money. Unfortunately, it's not available yet.)

TrueMotion-S is also fast. Compressing the same one-second sequence at LEAST, MEDIUM, and MOST took an average of 23 seconds (the differences at each setting were within a few seconds). Cinepak was considerably slower, taking 41 seconds to compress the same sequence at MEDIUM quality.

Hands-On Control

As I mentioned earlier, the QUALITY slider

doesn't tell the whole story. In fact, TrueMotion-S gives you much more control over compression parameters than any other software-only codec I've used. This is great, but it also means that getting the most out of TrueMotion-S requires a fair amount of tweaking.

Compression parameters are available through the Compression Parameters dialog (see Fig. 4; the dialog itself isn't labeled, but the manual refers to it by this name). How you get

to this dialog depends on your video editing program. In Adobe Premiere, an OPTIONS... button is at the bottom of the COMPRESSION SETTINGS dialog. In DeBabelizer, the OPTION key makes the button appear. If you're using a Mac and all else fails, you can get to Compression Parameters via the TrueMotion-S Control Panel.

To augment the LEAST to MOST presets, you can save your own custom configurations using the Compression Parameters dialog's Save As

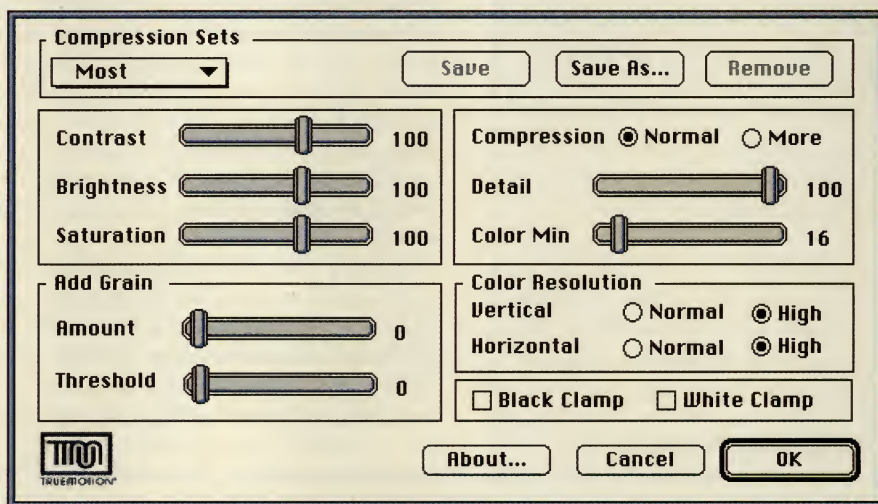


Figure 4. The Compression Parameters dialog (note that Compression Sets is the name of the pop-up menu; the dialog's name doesn't appear). If you can't reach it any other way, try the TrueMotion-S Control Panel.

INTRAFRAME VS. INTERFRAME COMPRESSION

T rueMotion-S is an intraframe compression algorithm, meaning that each video frame is compressed and decompressed independently. This contrasts with interframe schemes such as Cinepak and MPEG in which keyframes are stored, but between them everything is discarded except differences between one frame and the next.

One advantage of intraframe compression is that all data needed to draw a frame is readily available. An interframe algorithm may need to read and decompress several adjacent frames simply to display

one image. As a result, you can start playback of an intraframe-compressed clip from any frame without waiting for the system to compute the image — an important consideration for interactive applications. Intraframe compression also enables viewers to play video in reverse, which isn't practical with interframe compression.

But intraframe algorithms have a significant drawback: relatively low compression ratios. Since they don't discard as much data as interframe schemes, they tend to yield larger file sizes.

TRUEMOTION-S

button. It's easy to build up a library of compression settings that work well for the types of video you use most often. Note that while you can use the presets as a starting point, you can't save your own settings over them.

The interface for using custom configurations is a minor annoyance. The only way to select one is from the pop-up menu la-

beled COMPRESSION SETS in the Compression Parameters dialog. Once you've done this, the QUALITY slider adopts the value 88 — the only indication that a custom configuration is in effect. However, the slider doesn't work both ways. That is, setting the slider to 88 doesn't load the most recently used custom configuration.

It would also be nice to have a preview with the Compression Parameters. It's pretty inconvenient to have to go back and recompress a test image every time you make a change.

Tweaks

It's not necessary here to go into a complete description of TrueMotion-S control parameters. The manual does a good job of that. In short: All image-compression algorithms work by reducing the amount of information in the image. The control parameters available in TrueMotion-S allow you to specify the information you want most to preserve. You can adjust BRIGHTNESS, CONTRAST, SATURATION, and ADD GRAIN to help break up banding.

You can scale the degree of compression between NORMAL and MORE in conjunction with sliders for DETAIL and COLOR. Compression scaling works only if the horizontal resolution of your video is a multiple of 12. If you want to use it on a "quarter screen" video, you'll need to resize it to 312x232 rather than the usual 320x240. Rather than resizing, I recommend using the IMAGE PAN filter in Adobe Premiere to crop the video.

TrueMotion-S is very sensitive to the quality of the raw video you feed it. I got the best results when I followed the manual's recommendation and broke my video into individual scenes, each of which I then compressed using different settings. This was time-consuming, but the increase in quality was definitely worth it. This would be especially true for work likely to end up on a CD-ROM.

For source material I used clips from a promotional video I'm editing. The footage was shot in Betacam SP and digitized with Radius VideoVision Studio. I also tried some tests with a Canon L1 Hi-8 camera. The results were good, but the difference was notable due to the lower initial quality. (The additional noise is harder to compress and tends to introduce artifacts.)

Decreasing the contrast, like using the lower quality presets, really helped the compression ratio but at the expense of image quality, yielding a slightly washed-out look and decreased brightness. If the image is fairly dark to begin with, you'll want to increase both brightness and sat-

PROS AND CONS

Pros

No additional hardware required for playback. Superior video compression especially at the lower QUALITY settings. Supports a variety of delivery platforms. Because TrueMotion-S is an intraframe algorithm, viewers can start playback from any frame.

Cons

Getting the best results involves substantial tweaking. Licensing fees required to distribute decompression software.

Bottom Line

A realistic solution for delivering superior video on CD-ROM.

TRUEMOTION-S

Description

Software-only video compression algorithm for QuickTime or Video For Windows.

System Requirements

Macintosh: Quadra 800 or better (Power Mac recommended), 16MB RAM minimum (32MB recommended), System 7.0.1 or higher, QuickTime 2.0, Apple Multimedia Tuner 2.0.1, QuickTime-compatible video editing software.

Windows: 486/66 (Pentium recommended), 16MB RAM minimum (32MB recommended), Windows 3.1 or higher, Video For Windows, 16-bit capable display adapter (DCI recommended), Video For Windows-compatible video editing software.

Features

High-quality intraframe video compression with extensive control parameters. Playback on Mac, Windows 3.1, Win95/NT (32-bit), 3DO, and Sega platforms.

Suggested Retail Price

\$495 with a license to include TrueMotion-S decompression software in up to 1,000 retail CD-ROM units (divided among any number of titles); \$995 with license for 10,000 retail units; \$4,995 with license for 100,000 retail units; \$4,995 with license for unlimited internal use at a single site. Additional licenses \$695 for 10,000 retail units; \$3,995 for 100,000 retail units.

Contact


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uration to compensate.

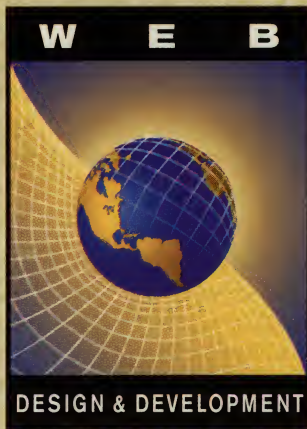
Of course, at very low CONTRAST settings, the BRIGHTNESS control can be really sensitive. If you're planning to move your video to another platform, make sure you do some test clips. The gamma (intensity range) is quite different between the Mac and PC. Video clips that look fine on the Mac will appear darker played through most PC video cards. This can be a problem with low CONTRAST settings.

Conclusions

TrueMotion-S is impressive, even using only the default presets. If you take the time to tweak the compression parameters — trial and error are most effective guides, with special attention paid to brightness and contrast — it really shines. On the whole, I like the quality of the output better than that of Cinepak, and it takes less time as well. The manual is well written and does a good job explaining what the various controls do.

One drawback is that Horizons charges a licensing fee for including their decompression software in your end products. This is an extra expense for developers accustomed to getting Cinepak at no extra charge with their QuickTime licenses. However, Horizons' licensing plan is flexible and unlikely to break the bank for most projects. I'll definitely consider TrueMotion-S for my next CD-ROM. 

John Worthington was the project leader for QuickTime 1.0. Now he presides over MojoSoft, a company specializing in tools to capture and process digital media.



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PRECISION AUDIO FOR PREMIERE

A TUTORIAL REVIEW OF WAVES Q2 PLUG-IN FOR ADOBE PREMIERE (MAC)

B Y C H R I S M E Y E R

During your honeymoon period with multimedia you capture video, grab stills, and plug them straight into your presentations. As you become more critical you learn how to clean up your sources, doing color correction and rebalancing, removing imperfections, and the like. This leads to experimentation with creative applications of these techniques.

The same applies to audio. Although raw captures might seem fine initially, eventually you realize the need for frequency "correction and rebalancing," maybe to remove boominess from one voice and put some body into another, or to eliminate hiss, ground hum, or room tone from a recording. The tool for these tasks is an audio equalizer (EQ), and one of the best equalizers available for multimedia production is the Q2 software plug-in from Waves.

Warping Frequency

Q2 is the baby brother of Q10, a plug-in equalizer originally developed for Digidesign's Mac-based digital audio workstations. Recently Waves introduced a software shell, WaveShell-P, that enables Q10 and their other highend plug-ins to integrate with Adobe Premiere running on a Power Mac with no additional hardware. Meanwhile, Q2 remains a very cost-effective software-only equalizer for Premiere running on the Power Mac or 68000-based Macs with an FPU. If all goes according to plan, by the time you read this it will work with other programs as well, such as OSC's Deck II.

Within Premiere, audio is encoded as either a one- or two-channel (mono or stereo) clip.

Premiere is capable of trimming start and end points and setting volume level, but other processing is performed by adding a plug-in *filter* — that's Premiere terminology, not to be confused with the audio filter types provided by Q2. If you apply Q2 to a Premiere clip, the graphic editing window appears (see Fig. 1).

The main portion of the window graphs the equalization curve you're applying to the clip. Frequency from low to high is represented from left to right along the horizontal axis and the amount of cut or boost runs vertically from the bottom (at the center "0" mark there's no cut or boost and thus no effect). The frequency range encompasses the limits of human hearing; the boost/cut range of ± 18 decibels is more than most equalizers, hardware or software, provide. Even deeper boosts and cuts can be accomplished by applying Q2 multiple times to the same clip.

You can adjust curves for the right and left channels individually or *strap* them to apply a single curve to both. In this case the curve is drawn in purple; otherwise the left channel is blue, and the right channel red.

Q2 is very controllable and very easy to control. If your background is graphics, you might expect to use a pen tool and/or Bézier curves to draw the desired EQ curve directly. In fact, the EQ design known as *graphic* works roughly this way. Q2, on the other hand, is closer to what's known as a *parametric* design, dividing the frequency spectrum into bands that can be controlled according to specific parameters. However, because Q2 displays the curve graphically, and because the graph supplies handles that en-

able you to adjust parameters by clicking and dragging, Waves calls their design *paragraphic*.

Regardless, keep in mind that when you're working with audio, your ears are much more useful than your eyes in determining the best EQ curve to apply.

Strike Up The Bands

The "2" in Q2's name means that it divides each channel's frequency spectrum into two bands, each of which can be assigned its own audio filter type. The list of available filter types includes PARAMETRIC (sometimes called *bell* for its curve shape), LOW SHELF, HIGH SHELF, LOW PASS, and HIGH PASS. An icon indicating the filter type currently applied to each band appears next to the band's number.

The parametric filter is the most precise tool for going after specific audio problems. It enables you to select a *center frequency* (the center of the bell) as well as the *bandwidth* (also known as *Q*, the range to be affected to either side of the center frequency) and amount of boost or cut. To remove 60Hz hum caused by bad wiring, for instance, you would set the center frequency to 60Hz, set the Q to a high value to create a narrow band, and then specify how severely you want to cut, as illustrated in Fig. 1.

The low and high shelf filters are more general in their effect. They take everything below or above the specified frequency and change its level by the same amount. This is good for broad changes in the overall sound, for instance, to boost the bass (apply the low shelf and boost everything below, say, 200Hz). The low and high pass filters are variations on the shelves. They cut very steeply, as opposed to boost, or cut broadly, below or above the *corner frequency* you set. The further away from the corner frequency in either direction, the more they cut. This is useful for applications such as removing hiss in recordings of speaking voices. Since critical frequency content rarely appears in a human voice above 10kHz, set the high pass filter just above that range (see Fig. 2).

You have several ways to adjust parameters. The most fun is to use the mouse, grabbing the crosshairs in the frequency graph that represent the center and corner frequencies, dragging them around, and listening to the result. You can also click in the parameter fields below and either drag the mouse to change their

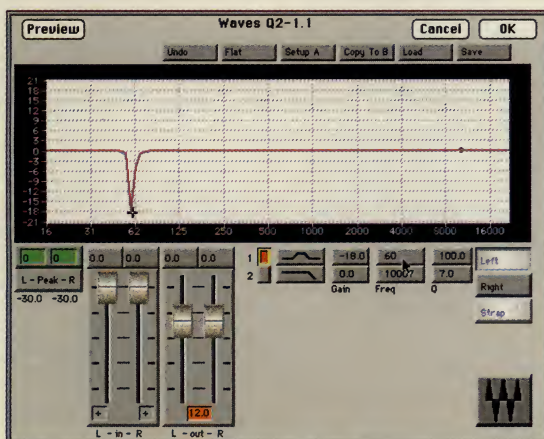


Figure 1.
Q2's editing window. To remove 60Hz hum, set the center frequency to 60Hz, set the Q to a high value to create a narrow band, and then specify how severely you want to cut.

PROS AND CONS

Pros

Precise and detailed audio frequency control, easy to use.

Cons

Only two bands of EQ, not cost-effective for all users.

The Bottom Line

An extremely capable tool for audio frequency balancing within Adobe Premiere.

values (the frequency graph updates to show you the result) or select them and type in new values. You can also disable/enable each band to hear how it's affecting the sound.

Boosting or cutting frequency bands typically boosts or cuts the overall volume level of the audio clip. To help keep this under control, Q2 provides both input and output volume controls. If you're boosting in a particularly active frequency range and the clip was recorded at a high volume level to begin with, you might overload the system and distort the audio signal. In this case, reducing the input level is a good idea. If you are cutting drastically, or if the clip was recorded at a low level, you might want to crank up the output volume accordingly. Q2 has a feature called AUTO TRIM that tells you how much you can boost the output before distortion occurs and adjusts the output faders automatically.

Other niceties include the ability to swap the left and right channels (in case that sound effect of a car driving by goes from left to right but your video goes from right to left). You can also invert phase. (Unlike RGB color values, which go from zero to some number such as 100 or 255, audio is bipolar, with values both above and below zero. Sometimes, through improperly wired cables or bad positioning of microphones, the phase of a signal might be the reverse of what you want. That is, it goes from positive to negative while the other channel is

going from negative to positive, resulting in a muffled, unfocused sound. Inverting the phase of one channel, or an entire clip relative to another that plays simultaneously, is the fix for this.)

Q2 allows you to save and recall parameter settings. I had some trouble with version 1.0, which wouldn't load curves I had saved, but that seems to be fixed in 1.1. Furthermore, each Q2 setup actually holds two curves, A and B variations that you can compare or swap between. There is also an undo function.

Diggin' Uncle Q

In the Nov./Dec. '95 issue, I reviewed an entire suite of audio plug-ins for Premiere — including equalizers — that lists for just \$30 more than Q2. How does Q2 stack up? Does it justify its relative expense?

If you are a newcomer to audio and don't expect to get deeply involved any time soon, then you probably don't need a tool as precise and relatively complex as Q2. However, if you are already an audiohead and don't want to go whole-hog for Waves' high-end stuff, you'll appreciate the variety of filter types, precise setting of parameters, ability to treat two channels separately, and visual feedback of the frequency graph. This is a software-based filter, so there is some delay as you wait to hear the result of your latest parameter adjustment. Also, Q2 is not quite as fast computationally as the plug-ins we tested in Nov./Dec. '95. But it makes up for this amply by being more interruptible and therefore more responsive. For example, you don't have to wait for a preview computation to be completed before stopping a preview, altering another parameter, and so forth.

My only real quibbles grow out of my experience with Waves' higher-end Q10 plug-in. Q2's default values for the corner frequencies of its two bands are identical with the lowest two bands of Q10. When you're limited to only two bands, you're not likely to use both of them at the lower end of the range. Of course you can change the default values, and to their credit

WAVES Q2 PLUG-IN

Description

Two-band audio equalizer plug-in for Adobe Premiere.

Hardware &

System Requirements

Macintosh with 68000 CPU and 881-series FPU or PowerPC CPU, System 7.0 or above, Adobe Premiere 4.0 or above.

Features

Two audio channels with two bands of parametric equalization per channel. Parametric, low shelf, high shelf, low pass, and high pass modes. Graphical and text-based parameter editing with undo. Control strapping between channels. Cut, copy, paste, save, load, and comparison of parameters. Input and output level controls with AutoTrim, level meters, and peak counter. Phase reversal and channel swapping.

File Support

AIFF, Sound Designer II, QuickTime.

Suggested Retail Price

\$99.

Contact

Waves, 4302 Papermill Rd., Knoxville, TN 37909; vox 615.588.9307; fax 615.588.9472; Internet <http://www.waves.com/waves>, waves@waves.com. Reader Service # 176

Waves provides a couple of presets with more useful defaults. Second, being an audiohead myself, I need more than two bands much of the time. Within Premiere, this requires either stacking up multiple passes of Q2 or moving up to the substantially more pricey Q10 with WaveShell-P (\$450 plus hardware dongle, \$100). (Waves AudioTrack, a combination four-band EQ, compressor, and gate, has been announced at \$300 and should be available by the time you read this.) At the end of the day, Q2 is an important tool in my bag of audio tricks for Premiere. How useful you find it depends on how much of an audiohead you are. However, if you really care about audio enough to clean up your sounds as much as you do your images, you're going to want this.

Chris Meyer is an audiohead who has also taken to modulating video for Los Angeles-based CyberMotion. Chris is also manager of technical research at Roland Audio Development and teaches digital audio at the Hollywood branch of the American Film Institute.

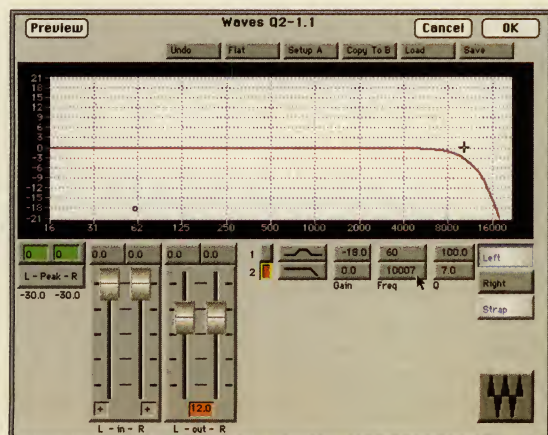


Figure 2. The high pass filter is useful for applications such as removing hiss in recordings of speaking voices. Since critical frequency contents in a human speaking voice rarely appear above 10kHz, set the corner frequency of the high pass filter just above that range.

Whistle a Distorted Tune

Audio Degradation in Desktop Video Systems

BY CHRIS MEYER

All I wanted to do was record a simple 1kHz audio tone to videotape to go along with some color bars. Instead, I found myself embroiled in a several-week journey learning how various programs and parameter settings messed with the audio I was playing back from my desktop video systems. Here's the 15-minute version of what I learned.

FFT & the 1kHz Tone

You're probably familiar with the practice of placing 30 to 60 seconds of color bars at the head of any videotape you record. This gives people receiving your tape a chance to see what your output device and VTR thought were black, white, and the colors in between. Comparing the color bars you provide with reference colors on a video vector scope, viewers can adjust their playback chain to make sure it outputs the same brightness, contrast, and hue as you intended when you created the tape.

It's also common to accompany the color bars with a 1kHz audio tone. This allows viewers to set the tape's audio output level near to the level you intend. The frequency of 1kHz is a good choice because it falls between the practical limits of frequency response (roughly 20Hz at the bottom, 20kHz at the top) and thus is unlikely to be affected by anomalies in the playback system, which usually are found in the extreme high or low end. Using a sine wave—a single frequency, the purest tone possible—makes any distortions or inconsistencies

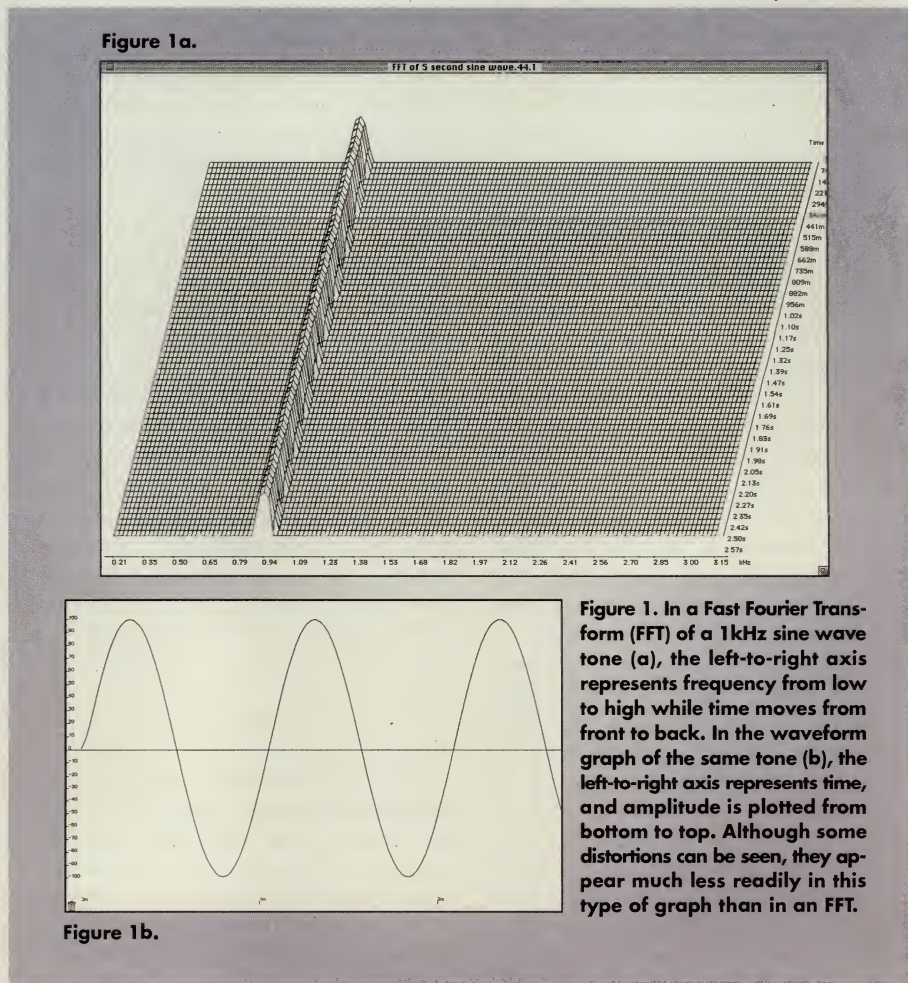


Figure 1. In a Fast Fourier Transform (FFT) of a 1kHz sine wave tone (a), the left-to-right axis represents frequency from low to high while time moves from front to back. In the waveform graph of the same tone (b), the left-to-right axis represents time, and amplitude is plotted from bottom to top. Although some distortions can be seen, they appear much less readily in this type of graph than in an FFT.

in the playback system immediately apparent. Competing frequency components in a test tone might obscure potential defects in the audio chain.

Fig. 1a shows an FFT (Fast Fourier Transform) of a 1kHz sine wave tone. The left-to-right axis represents frequency from low to high. Time moves from front to back in this simulated 3D display. The *amplitudes*, or strengths, of various frequency components are shown by the relative height of their ridges. Since a sine wave has no frequency components other than its *fundamental* (1kHz in this case), it looks like a lone ridge that stays constant over time. This is our reference of perfection.

I adjusted this FFT display to zoom in on the frequency region around the 1kHz tone and to show the loudness of frequency components in logarithmic rather than linear units. A logarithmic FFT display is a far better tool for analyzing audio than the shape of the waveform itself (Fig. 1b). Our ears detect the relative loudness of audio events in a logarithmic, not linear, scale. Therefore, something that might cause an undetectably small bump in the waveform may be very apparent to our ears. From another angle, when you consider that a 16-bit digital audio file has more than 65,000 potential amplitude values and that even a large computer monitor can show only



Chris Meyer is manager of technical research for Roland Audio Development. A self-avowed QuickTime Baby who bought a Video-Spigot, Hi-8 camera, and Premiere 1.0 as soon as they shipped, he also serves as resident tech for his wife's desktop motion graphics company, CyberMotion, in Southern California.

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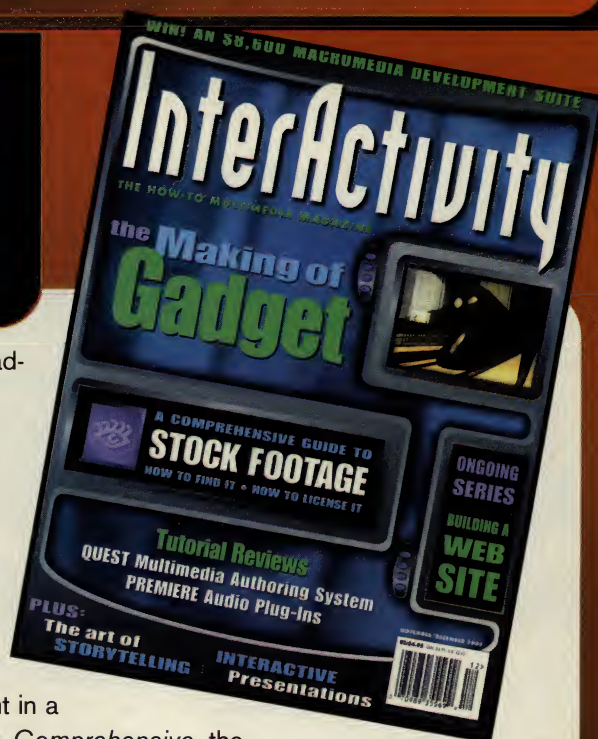
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Figure 2a.

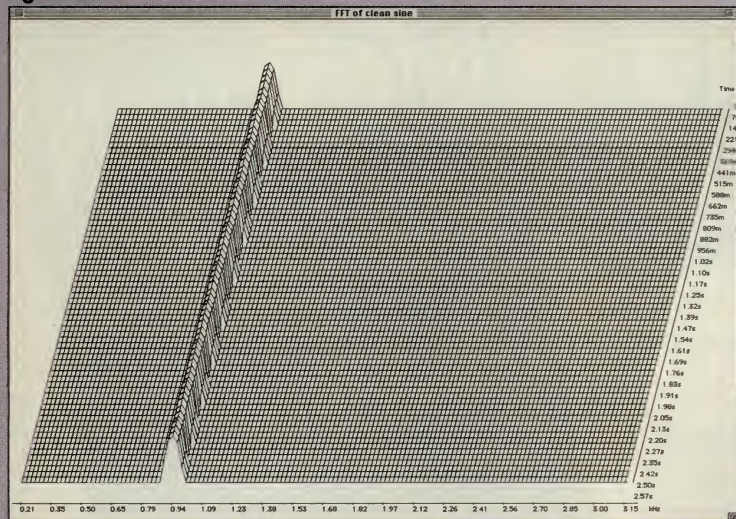


Figure 2b.

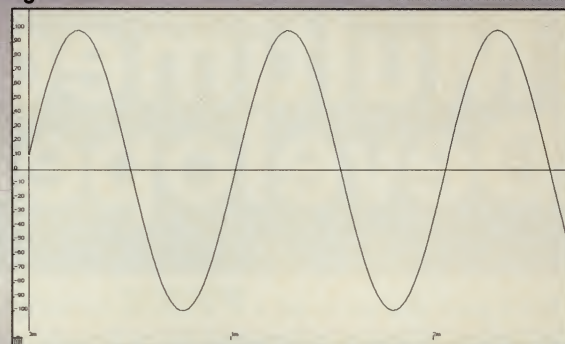


Figure 2. FFT of a 1kHz sine wave file (44.1kHz sample rate, 16-bit resolution) played back through a desktop video system with the proper settings (a) and the waveform graph of the same material (b).

about 800 (one pixel per increment) from the top to the bottom of the screen, it's easy to understand why looking at the waveform alone can be deceptive.

The Sample-Rate Conversion Blues

It is surprisingly easy to destroy the perfection of our 1kHz tone, even accidentally. Remember, any deviation from the single, straight, clean peak in Fig. 1a represents distortion.

Before you lose any sleep, let me reassure you that it is possible for a computer to play audio correctly. I created a 1kHz sine wave file at a sample rate of 44.1kHz and a resolution of 16 bits and played it back through a number of programs, including Apple

MoviePlayer and Adobe Premiere, through two different computers (a Power Mac 8100/110 with onboard audio and an old Macintosh Quadra 950 with a Digidesign Session 8 system driven via Apple's Sound Manager). When everything was set correctly, the result was virtually identical to the original tone (see Figs. 2a and 2b).

Unfortunately, it's easy to get these settings wrong. For example, Premiere has three different references for determining the sample rate for audio playback. If you simply open an audio clip and play it directly from the CLIP window, Premiere uses the clip's native sample rate (such as 44.1kHz). This assumes that your computer is capable

of playing audio at this rate — older Macs require an add-in card — and that you've set the Apple Sound control panel to play at 16 bits and 44.1kHz.

But when you preview your work, Premiere uses the sample rate set in its PREVIEW OPTIONS dialog. This usually defaults to "22kHz" (by the way, that's the old Mac rate of 22.254kHz, not the currently favored crossplatform rate of 22.050kHz). This causes the audio to be sample-rate converted from 44.1kHz to 22.254kHz — and the quality of the conversion leaves a lot to be desired.

I've been stung by this many times. Even if you set the AUDIO PREFERENCES to 44.1kHz and use Premiere's "enhanced" sample-rate

Figure 3a.

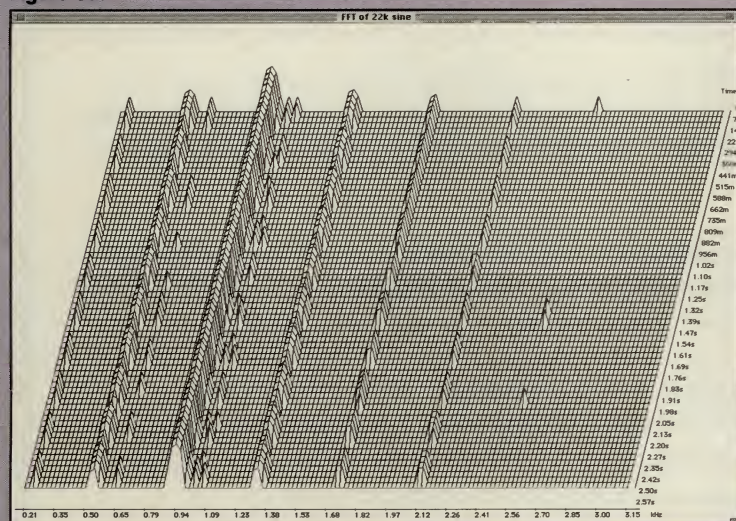


Figure 3b.

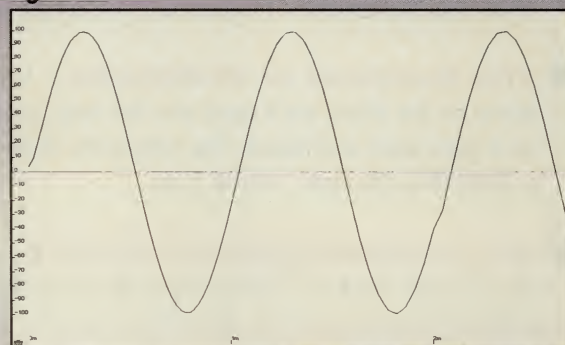


Figure 3. Distortions are easy to spot in this FFT of a 1kHz sine wave file (44.1kHz sample rate, 16-bit resolution) played by Premiere with Audio Preferences set to 44.1kHz and "enhanced" sample rate conversion (a). Each ridge is a new frequency component added by the conversion. These distortions are so drastic that they're visible in the waveform plot of the same file (b) where they appear as sloping, rather than rounded, segments.

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conversion, the result is a multifrequency tone rather than a clean sine. This result is depicted in Fig. 3a, where each ridge is a new frequency component added by the conversion. The distortions are so drastic that you can even see them in the waveform itself (Fig. 3b; look for sloping, rather than rounded, segments). You'll also get this result if you don't set the sample rate properly in the OUTPUT OPTIONS dialog — the settings of which are independent of the PREVIEW OPTIONS — when you render a final movie.

What if you actually want the audio to be converted to a sample rate other than the one at which it was recorded originally? Then perform the conversion in a specialized audio processing program such as Passport Alchemy (reviewed in *InterActivity*, January '96). It does a much cleaner job than Premiere. In fact, before starting a project, I convert all my audio source files to the rate at which I intend to output my final movie. Failing that, you'll get the best performance out of Premiere by converting to a rate that's an exact multiple of the original rate. For instance, convert from 44.100 to 22.050kHz rather than to 22.254kHz.

Time Waits for No Medium

So far we've been talking about sample-rate conversion, but audio distortion can creep in during playback as well. For example, recently much has been made of the timing problems that occur when the audio and video subsystems within a computer are driven by different clocks. The result is drifting synchronization between the sound and picture in QuickTime or Video For Windows movies. After a few

minutes' accumulation, the drifting synchronization becomes quite noticeable.

The preferred solution is to make sure the audio and video subsystems are locked to the same clock so they can't drift apart. However, not all systems are built in such a way as to make this possible. For example, both subsystems may be hardwired to their own crystal with no provision for following an external clock. The workaround is to vary the rate at which audio samples or video frames are played downstream from the clock. For example, video frames may be dropped or repeated to maintain general alignment with the audio. This is unacceptable for professional video applications, though. It makes moving objects appear to jerk and skip.

Alternatively, audio samples can be counted as they go by and the tally compared to how many should have passed for a given number of video frames. That is, roughly 44,144 audio samples should pass per 30 video frames, given a sample rate of 44.1kHz and a video rate of 29.97fps. If these numbers drift too far apart, audio samples are dropped or repeated, ideally with a bit of smoothing to cover any glitches in the final waveform. But even if the waveform is smoothed perfectly, the process still induces distortions.

One system that employs this technique is the Radius StudioPlayer application. Although the Radius VideoVision Telecast synchronizes audio and video clocks properly, the older VideoVision Studio (VVS) hardware does not. StudioPlayer compensates by dropping or adding audio samples. Fig. 4a graphs the distortion introduced when StudioPlayer plays a 1kHz sine wave at a sample rate of 44.1kHz using VideoVision Studio and external audio hardware (VVS

supports only 22kHz audio itself). Glitches caused by discontinuities in the audio are evident in the extraneous humps and peaks. The pitch warbles as well. Although this is readily apparent to the ears (and the FFT display), note that it is not visible in the waveform display (Fig. 4b) — so, again, when you're dealing with audio, trust your ears (or at least a logarithmic FFT display) rather than your eyes.

Blinded by Science

With apologies to Thomas Dolby, am I blinding you with science, or can you really hear the distortions described in this column? You can hear them all right — under some circumstances. With a pure signal such as the 1kHz sine wave, any distortion is evident, even to the untrained ear. When the sound is more complex, such as music or speech, it becomes more difficult to hear, especially to the untrained ear. The character of music and speech can help mask some of the distortion. Recording to a relatively imperfect medium such as analog tape can further blur the problem. But it is there — and very embarrassing when you are trying to record a "perfect" 1kHz reference tone.

It is not my intention to single out applications like Adobe Premiere or Radius StudioPlayer or even the Apple Macintosh for blame. I assume other programs and platforms have similar problems. However, these distortions wouldn't be considered acceptable to anyone designing an audio-only system. There's no reason they should be considered acceptable by anyone designing an audio-plus-video system. Let's hope the overall standards for audio rise as the art of desktop video continues to develop. 🐉

Figure 4a.

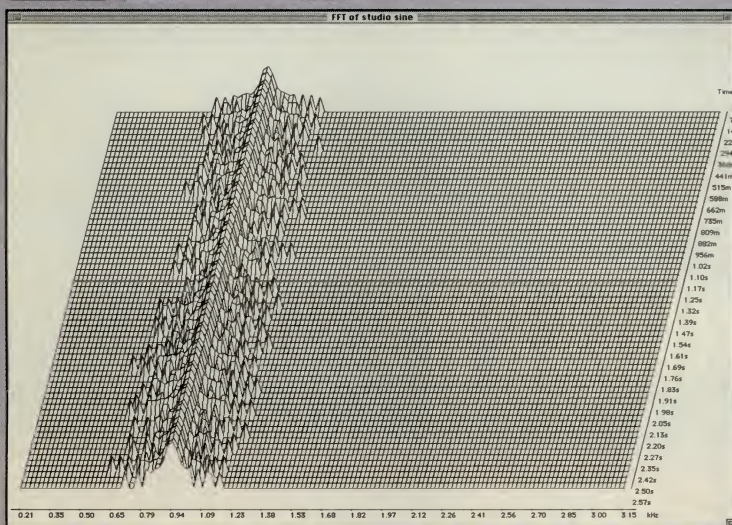


Figure 4b.

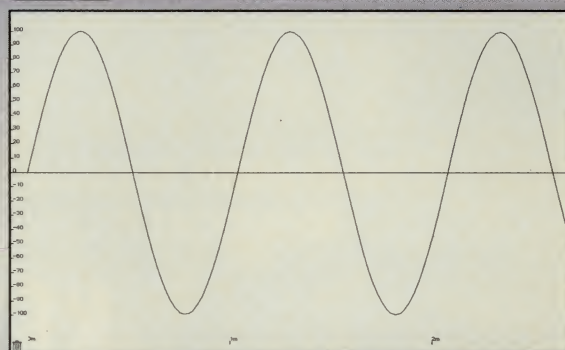
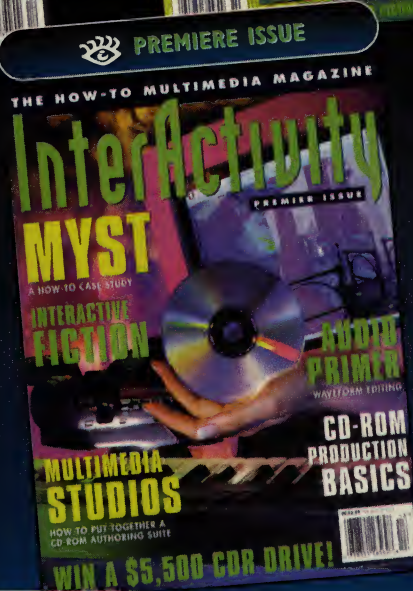
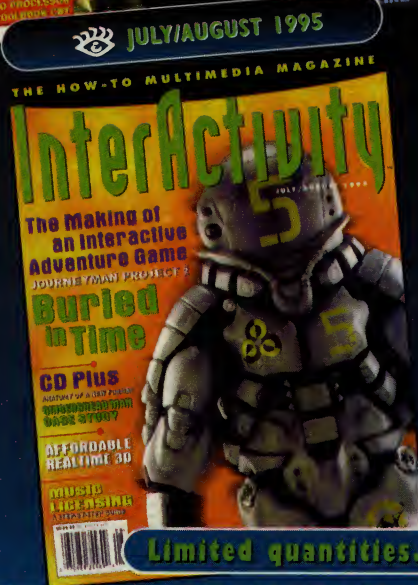
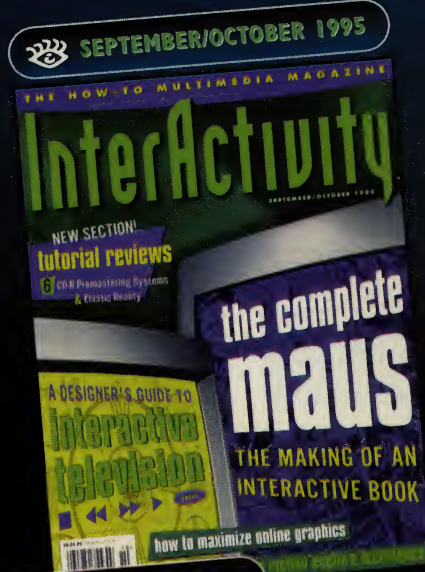
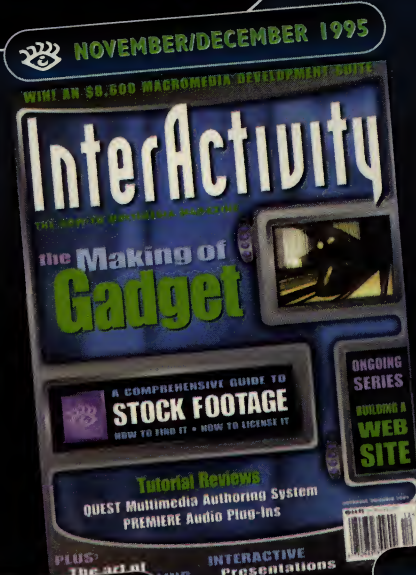


Figure 4. You can also see distortions in this FFT of a 1kHz sine wave file (44.1kHz sample rate, 16-bit resolution) played by Radius StudioPlayer with external audio hardware (a). Glitches caused by discontinuities in the audio are evident in the extraneous humps and peaks, and the pitch warbles as well. However, they're undetectable in a waveform plot of the same material (b).

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IA036

Mouse \neq Cursor, Part 1

Decoupling the Cursor from the Mouse and
Fashioning Their Relationship by Choice

BY ERIC JUSTIN GOULD

My cat T-Spoon, a beautiful and affectionate calico who had no choice but to be born in my attic on a cold winter night six years ago, is happily chasing a bug. The little black speck that causes her to bounce around, throwing her body left and right as she grabs the air with her cute little paws, sends the piles of paper on my desk flying.

Of course I should have known better than to play cat and mouse with her when the complexity of the mess on my desk was finally starting to gel. So when I take my hand off the mouse, the cursor hovers on my SuperMatch 21TXL monitor and T-Spoon loses interest just in time for me to shove her onto the floor.

Bill Buxton, principal scientist at SGI's Alias/Wavefront subsidiary, is right when he likens mouse-cursor interactions to the movement of a fly. In effect, most developers ask users to put their whole arm in a sock with a hole for one pointed digit at the tip. All the manual dexterity people have evolved over millions of years to express themselves is lost when we give users only a single blunt appendage with which to poke the screen.

But that's how all PC software uses the mouse, you may say. That's how Apple taught us, *told us*, to do it. A likely story, but wake up. It's 1996 already — don't blame the bullet on the gun! While you're waiting for hardware input devices that respect the breadth of movement our bodies are capable of, there's a lot you can do to expand the usability/playability of devices that everyone already has — namely mice, trackballs, trackpads, joysticks, and trackpoints.



Eric Justin Gould is the principal of MONKEYmedia, a design and production studio in San Francisco. He is a dancer and a musician, holds de-

grees in cognitive science and interactive telecommunications, and is on the faculty at San Francisco State University.

Why, you may ask, should I question the traditional relationship between input device and cursor? For many people this relationship is so ingrained that it goes unnoticed. The tradition to which I refer is exemplified by the more or less direct correlation between the position of the mouse on the mousepad and that of the cursor on the screen.

There are good reasons to consider alternatives. Several are justified as simple solutions to problems of usability — situations in which it's either more confusing or significantly less efficient to maintain a strict one-to-one mapping. More creative motivations arise when you're designing for a specific interactive feel. For instance, you may want to design an environment in which the cursor moves as if through sand on one side of the screen and water on the other. Or you may want to create representations of the participant on the screen that have a more dynamic relationship with the media than a cursor affords.

This month I'll lay the groundwork for conceiving and producing these novel interactions,

basic, possibly obvious vocabulary to prevent confusion later when we get into the math. Since we're concerned with building custom relationships between the input device and the display, it won't do to call the poking thing on the screen a mouse. (At this point, stop reading and take a moment to let Fig. 1 emblazon itself on your brain.)

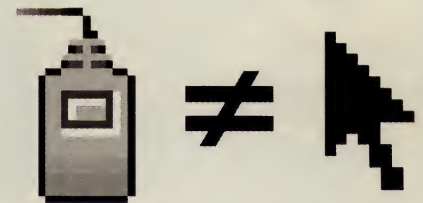


Figure 1. A frequently misunderstood relationship.

HANDware

The *mouse* is a chunk of plastic attached to the computer by a cable. Usually it has a



Figure 2. The traditional theater stage was tilted at an angle not far from halfway between the horizontal mousepad and vertical video display.

following up over the next few issues with detailed discussions of appropriate situations and code solutions. But first I'd like to survey some

ball inside and a couple of optical sensors on spindles that measure the ball's movement. People cup one of their hands over this thing

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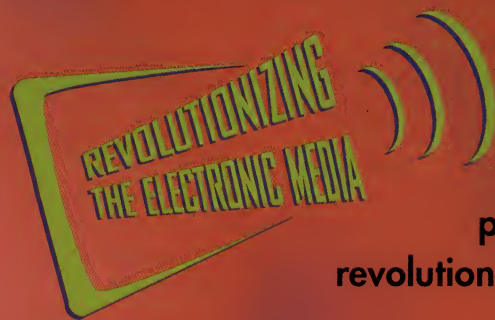
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INTERFACE DESIGN

and roll it around on a rubber-backed plastic or cloth rectangle called a *mousepad*. To a mouse, the mousepad is a stage on which to perform. To a mouse's person, upstage is far and downstage is near (see Fig. 2). When, dancing across the stage, a mouse runs out of space, it leaps up and jumps back to get more room. Since its movement is measured only insofar as the ball turns in its belly, this is a silent, though cumbersome, extension of the mouse's kinesphere.

The *trackball* is often likened to an upside-down mouse whose body remains in place, its bellyball exposed to the human hand. It, too, has a pair of optical sensors on spindles that measure the movement of the ball. In either device, while the ball can roll in any direction, the spindles lie perpendicular to one another, one oriented from left to right in front of the person, the other near to far. The sensors notice movement only along the axes of the two spindles. The trackball is uniquely unbounded; that is, a person can roll the ball smoothly and uniformly forever without interruption.

A *trackpad* or *touchpad* is like a mousepad without a mouse, a tiny stage on which one of a person's fingers roams. Originally developed for notebook PCs, these devices have the same awkward boundedness as a mousepad. When sliding toward an edge, the hand lifts its finger, moves it back, places it down again and continues on its way. A *touchscreen* is like a big trackpad built into a video monitor, but since touchscreens are married to the display, we won't be discussing them in this article.

The last input device I'd like to highlight is the *trackpoint* (see Fig. 3). Depending on the brand of notebook PC it's built into, it might be called an AccuPoint, EasyPoint, TruePoint, or FuPoint. It looks like a hard little nipple standing up in the center of the keyboard. Some manufacturers go so far as to fabricate it out of supple pink rubber. Regardless of what this says about the relationship between our bodies and the evolution of technology, it works like a mini-joystick, responding to directional

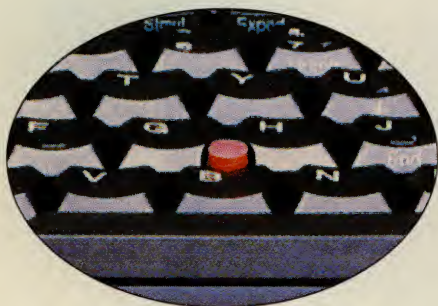


Figure 3. The trackpoint, a.k.a. AccuPoint, EasyPoint, or TruePoint.

pressure. The physical range of motion is bounded, but the measurable impact of its position is unbounded. That is, as long as someone's finger has the stamina to push it to the left, it sends out "going left" signals. When released, it snaps back imperceptibly to center position, the *physical origin*.

All these devices are related and seem to affect objects on the screen in identical ways, but they do so through means sometimes diametrically opposed. For present purposes we're concerned particularly with the quality of boundedness, both physical and numerical.

EYEware

On the topic of boundaries, let's take a look at the *screen*. Everything we see on the computer is shown through the screen. If the viewer has multiple screens, then the screen space is not necessarily rectilinear — but this complicates matters, so for now let's focus on a system with only one screen, say, 640 pixels wide and 480 pixels high. This is our *global coordinate space*. The *global origin* is in the upper left corner (0,0) and the farthest reach from there is 639 pixels to the right along the *x* axis and 479 pixels down the *y* axis to the point (639,479).

Local coordinate space is measured within a single window, such as Macromedia Director's Stage. The *local origin* is (0,0) in the upper left corner of the window, regardless of where it sits on the screen (see Fig. 4). A local positive position *a* = (200,100) is down and to the right of the origin, while a relatively negative position *b* = (-100,150) is to the left of that window's bounds. If the origin of the stage in focus is at global position (200,100), then *a* would be found at global position (400,200) and *b* at (100,250).

The *cursor* is the little thing that flits across the screen when a person acts on or with an input device. Usually it looks like an arrow — white with a black outline in Windows; black with a white outline in MacOS. On special occasions it changes appearance to help people perform a specific task. Over text windows, for example, it turns into a vertical bar, defining a break between characters better than a point can. Of particular note is when it turns into a spinning ball, inviting people to find a special place on their screen to put it.

Basic MEASUREMENTS

When moved, an input device sends out data about what the user wants to do. The data values may be considered independently, in relationship to one another, and over time. The cursor may be interpreted in the same variety of ways.

Position (*x,y*) is absolute. A mouse can have position on a mousepad, but this is misleading because it means nothing to a computer. A trackball clearly has no physical position, but a trackpad does — that of the finger touching

it. A trackpoint has position as well; imagine it as a joystick with a full range within which to be positioned. A visible cursor has global position on the screen and local position for each window on the screen.

In pseudo-code (note: the instructions that follow are applicable to many languages but not executable in any language in particular) we can get and store the location of the cursor:

```
put the position of the cursor into (x, y);
```

Distance ($\Delta x, \Delta y$) is a relative change in position ($(x_1 - x_0), (y_1 - y_0)$). Mice and trackballs don't know where they are, but they do report how much they've moved. That is, change is precisely what their sensors detect. We can also measure the delta of a cursor, or how far it traveled in a given time period:

```
at time  $t_0$ 
  put the position of the cursor into ( $x_0, y_0$ );
at time  $t_1$ 
  put the position of the cursor into ( $x_1, y_1$ );
 $\Delta x = x_1 - x_0$ ;
 $\Delta y = y_1 - y_0$ ;
```

And because *x* and *y* are perpendicular to each other, the right angle formed between them allows us to find the combined distance. Since $a^2 + b^2 = c^2$ for all right triangles:

$$\Delta \text{Space} = \sqrt{(\Delta x^2 + \Delta y^2)};$$

Time (*t*) on a computer can be measured a number of ways, but a common technique is to use *ticks*. Ticks are 1/60th of a second. Ticks are too infrequent to use in perception experiments, but they constitute a high enough temporal resolution for most interactions. In comparison, video runs at about 30 frames per second, marking time half as often. To find out how much time has passed between two events:

```
at time  $t_0$ 
  put the ticks into timeInTicks $_0$ ;
at time  $t_1$ 
  put the ticks into timeInTicks $_1$ ;
 $\Delta \text{timeInTicks} = \text{timeInTicks}_1 - \text{timeInTicks}_0$ ;
```

To calculate out how long that was in familiar time:

$$\Delta \text{timeInSeconds} = \Delta \text{timeInTicks} / 60;$$

What You Don't See Can Help You

Have you ever noticed how rolling the mouse at different speeds over the same distance on the mousepad has different effects on the distance the cursor travels on the screen? Take this page and lay it over your mousepad. Move your cursor to the left side

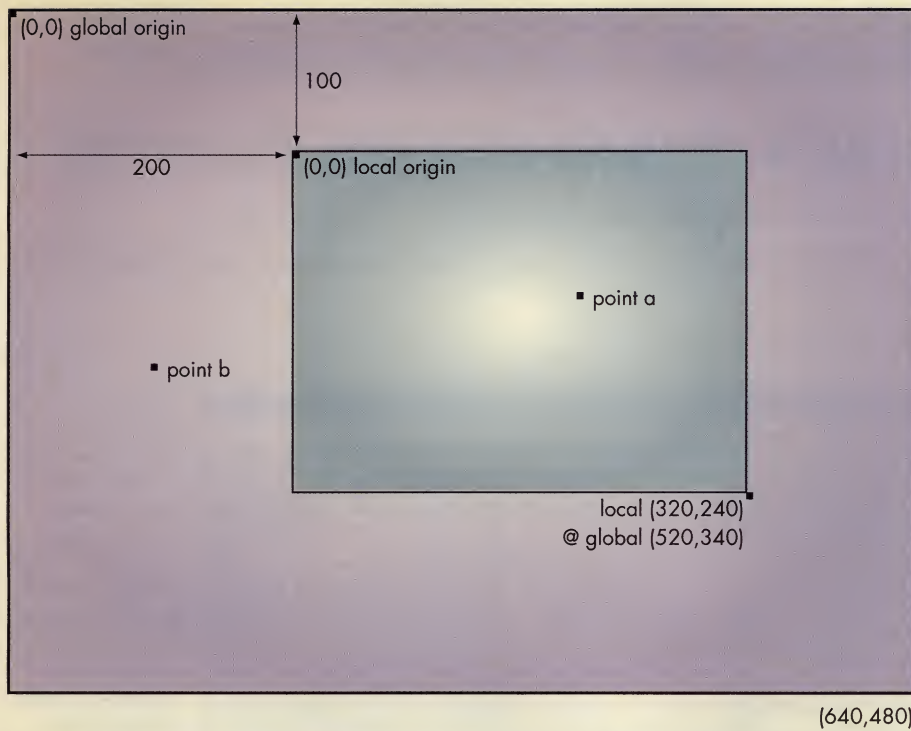


Figure 4. How can you be in two places at once when you're really nowhere at all? The local and global coordinate matrices of virtual space put you precisely in that situation.

of the screen and place the mouse over the outline on the left side of the page. Now roll the mouse over to the other outline quickly. The cursor should move across the entire screen in a single swipe. Now, see how slowly you can move the mouse — try to get the mouse all the way to the other position on the mousepad without letting the cursor move more than 1/3 of the way across the screen.

Velocity (V) is how fast movement occurs, the change in position over time: the distance traveled from point *a* to point *b* divided by the time it takes to get from point *a* to point *b*. By attending to velocity, the system software is able to give users the ability to get around quickly without sacrificing precision control when it's needed. If we are to do more than the system software does, we need to be able to derive average velocity ourselves:

```

at time  $t_0$ 
  put the ticks into timeInTicks0;
  put the position of the cursor into ( $x_0$ ,  $y_0$ );
at time  $t_1$ 
  put the ticks into timeInTicks1;
  ΔtimeInTicks = timeInTicks1 - timeInTicks0;
  put the position of the cursor into ( $x_1$ ,  $y_1$ );
  Δx =  $x_1 - x_0$ ;
  Δy =  $y_1 - y_0$ ;
  Δspace =  $\sqrt{(\Delta x^2 + \Delta y^2)}$ ;
  Velocity = Δspace / ΔtimeInTicks;
```

Acceleration (a) is the rate of change of velocity with respect to time ($\Delta V / \Delta t$) — the process of speeding up or slowing down.


Calculating acceleration requires at least four time and space checks and is useful in

easing takeoff and landing of the cursor. By noting changes in speed, we can get a pretty good sense of where the user is heading.

So in anticipation of the cursor's trajectory, we can optimize its motion to suit the phrase of the participant's intended gesture, thus minimizing their effort. But the acceleration curve must be tailored for each type of input device because of differing relationships between hands and devices. For example, the way large and small trackballs fit one's hand affects the raw accuracy of their use as well as the ease of initiating and completing movements.

```

from time  $t_0$  to time  $t_1$ 
  calculate  $V_0$ ; instantaneous starting velocity (avg.)
from time  $t_1$  to time  $t_2$ 
  calculate  $V_1$ ; acceleration period in question
from time  $t_2$  to time  $t_3$ 
  calculate  $V_2$ ; instantaneous ending velocity (avg.)
  acceleration =  $(V_2 - V_0) / (t_2 - t_1)$ ;
```

At this point we have all the tools necessary to create custom time/space relationships between physical and virtual worlds. Next month we'll use Director XObjects to accomplish bounded movement, infinite movement, and preparations for and exits from interactions that don't involve a cursor. 

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A Music Composer's Productivity Booster

Scoring Multimedia Automatically Using
AudioTracks Professional 2.0 by Blue Ribbon Soundworks

BY DAVID JAVELOSA



while back I discussed the demo for AudioActive by Blue Ribbon Soundworks, a nifty system for embedding self-arranging music within an application.

Since then I've been having great fun with their latest release, AudioTracks Professional 2.0 for Windows (\$149). Like the demo, this program is built on the AudioActive engine and draws on a pre-existing database of musical styles, moods, and instrument combinations. Recently Blue Ribbon was acquired by Microsoft, so you're bound to hear more about this technology.

Unlike the "mood window" or "juke box" metaphors found in the demo, AudioTracks Pro (ATP) gives the user control over specific parameters of music composition. Out of the box, the program is limited to the musical database supplied with it.

However, if you have another Blue Ribbon product, SuperJam (\$99), you can create raw materials yourself through SuperJam's paint-style interface and export them in an ATP-compatible format. With the developer version of SuperJam (available through special arrangement with Blue Ribbon), you can even create a style from a pre-existing MIDI file. This means you can import a snippet of a favorite song — or one that the game producer



Figure 1. AudioTracks Professional 2.0 is divided into four sections. **PREVIEW** enables you to determine the basic material while listening to realtime MIDI output. **COMPOSE** imposes an overall form and length. **PERFORM** stops and starts playback of the computer-generated output. **SAVE** exports the results in several useful formats.

wants something "just like" — export it as an ATP-compatible file, import it into ATP, and crank out endless variations.

Although it's advertised as the solution for multimedia producers who don't want to hire composers, Blue Ribbon emphasizes that this is not randomly generated music but an exploration of musical possibilities based on pre-composed elements. It still takes a musician's ear to create source material and to determine whether the computer-generated output manifests some degree of musical logic.

Keep in mind that the heart of the system, the AudioActive engine, can be incorporated into standalone titles, games, or whatever. AudioTracks Pro gives you a very controllable way to model and demonstrate possible results of style databases and performance parameters. Install them into a standalone program's control matrix, and your application will generate a limitless stream of appropriate music.

A Scoring We Shall Go

ATP is divided into four sections (see Fig. 1). **PREVIEW** enables you to determine the basic material while listening to realtime MIDI output. **COMPOSE** imposes an overall form and

length. **PERFORM** stops and starts playback of the MIDI data provided by the **PREVIEW** section after it has been modified by the **COMPOSE** parameters. **SAVE** converts your work into WAV, MIDI, or ATP parameter files.

You start by selecting among menu options for three major parameters in **PREVIEW**: **STYLE**, **PERSONALITY**, and **BAND**. The cross pollination of these factors generates the basic musical texture. The **STYLE** parameter might be described as rhythmic character. Options include labels like **SWING**, **BLUES**, and **PUNK**. It's easy to see how the program transforms a MIDI file according to this type of rhythmic pattern, redistributing the note to particular beats and applying specific articulations. (Sometimes selecting a certain style halts playback because some styles don't include variations for a particular selection of personality and/or band.)

In musical terms, **PERSONALITY** is scale or mode. This helps determine the music's mood — happy, sad, and more subtle expressions. This is where you determine things like major or minor keys. **BAND** lets you choose a collection of General MIDI instruments. It's easy to guess that a certain group of acoustic instruments would make a good combination for country music, or that an all-synthesizer en-



David Javelosa is a faculty member at the UCLA Extension and with the San Francisco State University Multimedia Studies Program. Formerly senior music designer for Sega Studios, his recent work includes music for Marvel CD-ROM Comics, Disney's *Pocahontas* video game, and an LP of 31st-Century lounge music.

semble would be right for industrial pop.

The three sliders at the bottom of the PREVIEW section are active at all times. They control ACTIVITY, TEMPO (turtle to rabbit), and KEY. In musical terms, tempo and key are discreet values such as a number of beats per minute and "C sharp." To keep the program friendly to non-musicians (and even provide some nice surprises for experienced composers), the latter two sliders offer somewhat less precise control. The ACTIVITY slider actually determines the density of chord changes or harmonic motion in a given amount of time, ranging from drone-like to chaotic. It tends to yield the most interesting results.

The PREVIEW section's instrument grid functions as a stereo mixer. By moving an icon up and down, left and right, you control the loudness and pan position of the associated instrument. The icons don't necessarily represent a specific instrument, but rather the instrument's function in the band. For instance, the keyboard icon can be anything from an accordion to a Farfisa organ. The trumpet represents the lead line, be it a distorted guitar or Irish flute. You can also mute instruments to hear their effect on the overall texture.

The COMPOSE parameters take all that good stuff being generated in PREVIEW and commit it to a structure (ever hear *that* at band rehearsal?). I like to start here because of the LENGTH feature, with which you can determine the length of the piece down to a tenth of a second. This is perfect for scoring that little digital video clip or filling your wave RAM budget with the maximum amount of soundtrack. The next pull-down menu is SHAPE, which gives the material a form over time. Shapes include RISING, FALLING, PEAKING, LOOPABLE, SONG, and RANDOM. These choices direct harmonic and rhythmic activity to create logical transitions, development, and an ending. If you're going for a big climax, try the rising shape. If your video is one long fadeout, try the falling. If you're shooting for the great American pop tune, try the song form — but you take your chances, because all these shapes are affected by your selection of style, personality, and band. Again, a musician's ear should be the final arbiter in the process.

The INTRO and END check boxes are particularly nice touches. They compose an opening and closing within the stylistic parameters you've set, while keeping within the previously determined length of the tune. This is another shot-in-the-dark operation that can yield pleasing results. The final element to the COMPOSE section is the magic rabbit-in-a-hat button that makes it all happen.

In the PERFORM section, tape-style transport controls are paired with a display that counts time in minutes, seconds, and tenths of a second. The clock is helpful for monitoring the precise time at which musical events occur so they can be synced more easily to events in a

video clip. The mixing grid remains active during playback. The values you export are the ones in effect at the time you hit the rabbit-in-a-hat button. Adjusting other PREVIEW parameters darkens the PERFORM controls and highlights the rabbit button, reminding you to "re-compose" the piece according to the new settings.

Of course, none of this would be worth much to developers without the ability to export the results in a variety of formats. In the SAVE section, saving MIDI probably is most useful for musicians who will be editing the composition further in another program. You can also save as an ATP file, which is essentially a snapshot of the parameter settings of the current composition. This is good for exporting to other Blue Ribbon products and for saving a train of thought for later. For programmers, there's a provision for saving this information to the clipboard for use in other applications and for transferring directly to an application in progress via the OLE drag-and-drop specification. This enables an ATP performance to be embedded as an object.

The coolest way to save your performance, however, is as a WAV file. This seems almost magical until you remember that AudioTracks Pro comes on a CD-ROM and on that disc is a wavetable set of General MIDI instruments (at least the GM instruments needed for the various BAND ensembles). You can select the sample rate (11kHz, 22kHz, or 44.1kHz), bit resolution (8 or 16), and mono or stereo — the most common space saving options for digital audio files. The dialog box even tells you how big the resulting file will be so you won't blow out your remaining hard drive space by accident.

The result is a real digital audio file of your composition. If you listen closely in PREVIEW to the style variations, you may notice a lot of delayed MIDI doubling in some of the voices. No DSP effects are available to fatten the mix when ATP renders a WAV file, but the MIDI delays fill out the sound fairly effectively. Constructing audio files in this way will never compare to even a small studio production, but it's a great way to create placeholder files for projects that will be using digital audio rather than MIDI.

The Buzz

AudioTracks Professional 2.0 is an amazing resource for producers of desktop presentations and corporate communication projects. It gets the job done with little fuss or expense, and its output is fully integrated into the Windows environment. For developers, the ability to create both placeholder files and original music for games and the like is just the tip of the iceberg. Incorporating the AudioActive engine within a title gives it the capability to generate entirely new original music every time

it runs — talk about repeat playability! Working with a composer to create MIDI databases, a programmer can add self-arranging music to everything from screensavers to multimedia construction kits.

Unfortunately, Blue Ribbon's acquisition by Microsoft has put licensing of AudioActive on hold indefinitely. Let's hope they make it available soon.

As a composer, I've found ATP to be a potent addition to my arsenal of compositional tools. It's worth its weight in gold just for its ability to generate appropriate chord changes automatically. Now that AudioActive technology belongs to Microsoft, I hope to see it popping up more and more in the Windows 95 world. 🐇

• Blue Ribbon Soundworks c/o Microsoft, Box 8689, Atlanta, GA 30306; vox 800.226.0212, 770.392.7490; fax 770.698.9603.

AUDIOTRACKS PROFESSIONAL 2.0

Description

Automated MIDI music composition and audio rendering software for Windows.

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More on Programming the BeBox

Transferring Files and Managing Windows

BY JOHN WORTHINGTON

The Internet (and my telephone) has been buzzing since last month when I shared some of my early experiences working with the BeBox. Friends I haven't heard from in years have been calling me to come by and take a look. There has been a lot of discussion on the Internet about the technical details of the BeBox, and new Web sites spring up weekly. In particular, the BeBox seems to have captured the imaginations of some diehard Amiga wizards. Perhaps the invention and imagination that characterized some of the Amiga's multimedia apps will materialize on the BeBox.

True to their word about wanting to support geeks and multimedia hackers, Be has been putting their technical documentation on the World Wide Web at <http://www.be.com> where everyone can take a look at it. My company, MojoSoft, is helping things along as well. We've decided to give away BeBop, the multitrack audio program I mentioned in my last column. The app, as well as the source code, is available at <http://www.mojoSoft.com>. Contributions to the source are welcome. Together we can have some fun and turn this into a very cool app.

Getting Started

At present, you have to use Metrowerks C++ to program the BeBox. Be includes a special Be version of the CodeWarrior compiler on the CD-ROM that comes with the hardware. You can also use the CodeWarrior PowerPC compiler on a Macintosh. Those still using 68k Macs should note that you don't need a Power Mac to compile PowerPC code. The only special trick in using the Mac to develop BeBox code is to use the header files and libraries that Be provides.



John Worthington is the founder and president of MojoSoft, a company specializing in multimedia technology and development. In his misguided youth, he wrote the

Macintosh MIDI Manager and was the project leader for QuickTime. His most recent project is the MusicNet CD-ROM.

I do my BeBox development on the Mac. I'm a big fan of having all my development tools and source code in one place. Also, it's nice to keep my source code separate from my crashing applications (not that my apps crash any more often than the next person's). Plus, I already have the Mac and CodeWarrior. If I didn't, I'd probably be doing my development on the BeBox.

Once you've compiled and linked your code, you have to move it to the BeBox. I do this using Ethernet. The BeBox comes with all the software you need to use Ethernet. Just add an ISA Ethernet card, which typically costs around \$35. Once that's installed, you can use ftp to move files back and forth between the BeBox and other machines on your network.

On the Mac side, I run FTP/d, a shareware application by Peter N. Lewis. It's a great interface between Mac file sharing and ftp. Once file sharing is turned on, you can ftp files to and from the Macintosh. This works over both your local network and the Internet. Peter has written lots of other great networking apps for the Mac. They're all worth taking a look at.

On the BeBox side, I use a script based on one I originally got from Steve Horowitz at Be. I can invoke the script by double clicking on it, making file transfers fast and easy.

There are two parts to the script. One is the script itself, which is just one line:

```
ftp myMac < ftp_BeBop
```

This starts an ftp session with the machine named myMac using the arguments in the file ftp_BeBop. To create the script, you would type this line into BeEdit, save it, and then use the CONVERT TO SCRIPT FILE option in the File menu.

ftp_BeBop is a straight text file. Here's what it looks like:

```
worthington
password
lcd /
cd Zippy/BeStuff
bin
get BeBop*
quit
```

Basically, this is what you would type if you were

doing an interactive session with ftp. The first two lines are my username and password. Then I set the local directory on the BeBox to the top level. I set the directory on the Mac to Zippy/BeStuff. The BIN command tells ftp to do a binary transfer. If you don't include this, it'll try to transfer your app as an ASCII file and you'll get less than desirable results. Finally, we get everything in Zippy/BeStuff that begins with BeBop and quit.

Never skimp on your tools. This includes scripts. Development scripts often seem like a waste of time. This is far from true. While this transfer script might only save me one or two minutes per transfer, it adds up fast.

It's All Relative

One of the main attractions of most object-oriented languages, and C++ in particular, is called inheritance. The details can be a bit messy, but inheritance lets you modify how an object behaves without having the source code for it. On the BeBox, this means you create new inherited versions of their objects that are customized for your application. If you want an object to behave a little differently, you don't have to rewrite all the routines — only those needed to make the object behave differently. Typically, these are things like drawing, keyboard input, and mouse tracking.

The Application Server, Windows, and Views

On the BeBox, the Application Server is an operating system process that handles most of the basic tasks that are common to all applications — things like keeping track of keyboard and mouse input, controlling the cursor, and rendering images into windows.

A BWindow object is the interface between the Application Server and your software. Each BWindow object runs as its own thread, so you get some of the benefits of a multithreaded operating system without breaking your application code into separate threads. [See last month's column, "Dangling By a Thread."]

Once you have a BWindow, you also need at least one BView. While a BWindow can display images, it can't draw them. BView objects handle drawing and event handling within windows. Each BView object is responsible for a rectangular area of a window. You can use as many BViews as you like to subdivide a win-

dow's area to manage groups more easily.

The Application Server communicates with these objects through a set of member functions. The most obvious of these is the `DRAW` function. The Application Server calls this function whenever a view needs to be redrawn.

Note that views are hierarchical. That is, a view can contain other subviews. Part of the default behavior of the `BView` objects' `DRAW` function is to call the `DRAW` functions for each of the subviews. Let's do a simple "About..." box.

First we need a `BWindow` object:

```
MyAboutWindow::MyAboutWindow()
: BWindow(myRect,"myAboutWindow",
  MODAL_WINDOW,
  NOT_MOVABLE |
  NOT_RESIZABLE |
  NOT_CLOSABLE |
  NOT_ZOOMABLE)
```

`MyAboutWindow` is a kind of `BWindow`. In the lines above, I pass along some parameters to initialize the `BWindow`. The first parameter, `myRect`, is a `BRect` object that describes the location of the window. The second parameter is the name of the object. It'll also be the name of the thread that is created for the window. This is optional, but supplying a name can make debugging much easier. Last we want a *modal window*, that is, one that must be closed before the user can do anything else. The final lines are flags that say the user can't move, resize, close, or zoom the window.

Here's the body of the code:

```
BRect r1;
/* Lock the window so no other
process can change its state */
Lock();

r1.Set(180,30,500,60);
// create the view
aboutView = new BStringView
(r1,"","A very fine program",
FOLLOW_LEFT_TOP,
WILL_DRAW);

// install it in the window
AddChild(aboutView);
// set the font and font size
aboutView>SetFontName
("Baskerville MT Bold");
aboutView>SetFontSize(24);
}
```

In the code above, the main work is creating a view and adding it to the window as a child, which inserts it in the hierarchy. The type of view we create is a `BStringView`, which simply takes a text string and displays it.

We don't have to write any extra code to display the string or draw the window. The default behavior of the objects takes care of that for us.

I chose to create the window for the "About..." box without a close box. This is much like the dialogs used on the Macintosh for similar purposes. The code treats any mouse click within the window as a request to close the window.

We do this by overriding the `FilterMouseDown` function. This function is called whenever the mouse is clicked within the bounds of a window. If it returns `TRUE` then the `BView` pointed to by `TARGET` has its `MouseDown` function called. If `FALSE`, then no other processing is done. In our case, we just call `QUIT`.

```
bool MyAboutWindow::FilterMouseDown
(BPoint where, BView ** target)
{
```

```
Quit();
return(FALSE);
}
```

`QUIT` is another member function of the `BWindow` class. It's the preferred way to dispose of a `BWindow` object because it cleans up the connection to the Application Server and gets rid of all the views. You should never use the delete operator to destroy a window. Bad things can happen.

A lot of this should seem familiar. Using the `MouseDown` function of a view will give the same effect as the code in my November/December '95 column, "Clicking On Pretty Pictures." Next month we'll continue with some sound programming on the BeBox. ☛

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Your Name in Pixels

Legal Aspects of Attributing Credit

BY CHARLES B. KRAMER

In 1909, the silent film star Florence Lawrence was known to her adoring public only as "the Biograph Girl." The mystery about her name was no accident. Biograph, like other studios of the era, kept the names of its stars out of film credits. But in 1910 Lawrence was lured to IMP, a competing studio, which publicized the transition by planting a newspaper story that she had been killed by a streetcar. A few days later IMP blamed the false story on Biograph and advertised with great fanfare that Lawrence was alive and well. The publicity stunt worked but also revealed Lawrence's name, and for the first time a film star was not anonymous.

Biograph's policy was based on fear that credit would give stars the power to demand more money. The fear was justified, but it had a bright side. The credit that gave stars fame and fabulous wealth also helped movie studios sell their films.

While interactive developers may never be tabloid staples like old Hollywood stars, whether and when they receive credit has important consequences. A famous example occurred in 1990 when Scott Miller of the game company Apogee Software was impressed with some games by Louisiana's Softdisk.

Softdisk identified the development team in their game credits. Miller wanted to write, "Call me. I have an opportunity for you," but he worried his letters would be intercepted and tossed. So he sent a stream of fan letters under different names, and they hung on a bulletin board for weeks until someone noticed: *same handwriting, same return address*. That revelation led to a phone call that led to the team reorganizing as id Software and moving to Texas. There they wrote *Wolfenstein 3D* and

the *Keen* series for Apogee, and later the landmark *Doom* — and the rest, as they say, is interactive history.

One legal authority observes that "in the entertainment industry the credit clauses of an agreement are often considered of greater importance than the provisions for monetary compensation." That is, credit can be worth

"The surest way to keep your name out of the pixel limelight is the same as the surest way to keep your name in it: by agreeing to specific credit terms in a written contract."

more than cash. But credit is also dangerous. While it builds developer morale and a reputation that helps sell future titles, it also hastens the day a development team can strike out on its own. It can also cause problems when credit information is inaccurate, incomplete, or unwanted.

As a result, credit raises important legal and contract negotiation issues. What types of credit can be sought? When is there a right to get credit? When is not receiving credit important?

Types of Credit

Credit can be divided into three types: *function*, *source*, and *publisher*. Each requires different considerations.

Function credit is traditional film-style billing, which refers to (in the words of an entertainment law treatise) "the listing of a person's or company's name next to the function which that person or company performs with respect to an entertainment venture." Negotiating function credit requires identifying a label for the function performed. Some labels such as "software engine designer" are unique to interactive titles, and others such as producer, director, and scriptwriter are borrowed from the film world. Developers who seek work in a particular specialty may want to negotiate for a narrow label that describes it ("network drivers for multiplayer version") rather than a broad label ("additional programming").

Source credit identifies pre-existing material incorporated into a title. The purpose is often to define the involvement — or the lack of involvement — of the source of the pre-existing material in the title as a whole. For example:

- ▶ Possessory credit credits a person or company as the source of a title as a whole. In films, such credit sometimes is given to a producer, director, or writer ("Steven Spielberg's *Close Encounters*"). This requires the recipient's involvement with, or at least approval of, the film or its screenplay.
- ▶ Based-on credit attributes the source from which a title is adapted ("*Lawnmower Man*, a film based on Stephen King's short story of the same name"). Based-on credit is considered appropriate, at least in films, whenever a work or a significant part of it is so similar to a source that making it without permission would be a copyright infringement. Because based-on credit can be legally appropriate even for very loose adaptations, it is sometimes controversial. Consider a case involving *Lawnmower Man*, for instance. The author Stephen King failed to get removed based-on credit referring to his short story because a small but significant part of the film was similar to the story.



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▶ Trademark credit distinguishes the marks used on a title (such as the name of the title) from the marks of unrelated companies that are used for only explanatory or comparison purposes (“requires an *AdLib* compatible sound-card”). Trademark credit often takes this form: “*Moonbeam Rider*® and *RocketGame*® are registered trademarks of RocketSoft Inc. All other trademarks are the property of their respective owners.”

Publisher credit distinguishes the independent developers of an interactive title from the company that publishes it and from the sometimes separate company that boxes and ships it (“*Doom II*, distributed by GT Interactive Software”). Publishers often prefer to omit or minimize credit for developers to reduce the risk they will try to parlay a hit title into a fully independent company. Developers, in contrast, sometimes seek a “private label deal” that omits or minimizes the identity of the publisher to make the developers appear to be independent already.

After you’ve negotiated the credit types you require, determine where the credit will be placed. In films, credit placement is a huge issue. Film contracts often discuss with nearly pathological precision a credit’s comparative font size, color, onscreen duration, and place within the hierarchy of other credits. Contract clauses for interactive developers can be even more extensive because there are more places credit might appear, including:

- ▶ Opening screens, closing screens, or an “about this title” menu option.
- ▶ Boxes, other packaging, disks, and instruction manuals.
- ▶ Online versions.
- ▶ Derivation, such as any sequel, novel, or film.

However, none of the fine points about what credit can be requested or where it should be placed matter when credit is refused.

The Right to Get Credit

In general, no one — not a producer, programmer, artist, or author of source material, whether an employee, contractor, licensor, or anything else — has a *right* to credit unless a contract gives it. As long as a company owns permission to publish a title, the title can contain complete credits or no credits.

Given the importance of credit and the frequency with which it is expected, these rules may seem unfair. Perhaps for that reason these rules are subject to a growing list of exceptions. But few of the exceptions protect interactive developers. For instance:

- ▶ A contractual obligation to provide credit can be implied from industry custom. How this works in the interactive world is dangerously unpredictable, since its customs mostly haven’t formed yet. But even when customs are clear, a demand for credit based on an implied obligation usually fails for work performed without a written contract. A credit obligation is even less likely to be implied when a written contract exists but is silent about credit. Still, the surest way to avoid the danger of implied credit terms is to deal with credit explicitly in a written contract.
- ▶ Some unions, such as the Screen Actors Guild, require credit clauses in certain contracts.
- ▶ The Copyright Act was amended in 1990 to give the right to receive credit in connection with displays of visual art. Visual art, however, is limited to paintings, drawings, sculptures, and photographs that either exist as a single copy or in limited editions signed by the artist. A few states, including California, New York, and Pennsylvania, give a right to claim authorship for a similarly narrow class of “fine art.”
- ▶ Some states require the disclosure of the “name of the performer or principal artist” on the outside cover of recordings.

For developers, the consequences of all this are simple: If you want credit, get it promised in writing. For publishers, the consequences are more complicated. In theory, absent a contract, publishers can give or withhold credit as they wish, but in practice they must be very careful that credits are not inaccurate or misleading.

A credit is inaccurate, among other situations, when it’s given to the wrong person. In the 1981 case of *Smith v. Montoro*, for instance, an actor complained when someone else was given a credit for his performance in a film. The court found that audiences would be deceived about the true source of the actor’s performance, and as a result the actor had a right to sue. In the 1988 case of *LaMothe v. Atlantic Recording Corp.* the court went further. There credit was given to only one of the three writers of a popular song. While giving no credit might have been legal, partial credit was misleading and the songwriters whose names were omitted had a right to sue.

Credit can also be inaccurate when it is excessive. An interesting example involves the novelist Ken Follett, who as a young man fought for authorship credit on a nonfiction book he edited and revised. The publisher credited the original authors, only adding the phrase “with Ken Follett.” When Follett later became hugely popular, the publisher planned to reissue the book with Follett’s name first and

the names of the original authors in smaller print. Follett sued on the grounds that the new credit inaccurately identified him as the principal author and won.

The Right Not to Get Credit

Follett’s story is a reminder that in the battle to get prominent and substantive credit, developers often fail to provide for situations in which they might prefer *not* to get credit. In the interactive world, these situations include:

- ▶ When an interactive title is ported from one hardware platform to another. The music component of a title is particularly vulnerable to degradation when ported from a computer system to a game cartridge or other dedicated game system.
- ▶ When a developer contributes to a title that, to the developer’s sensibilities, is inferior, vulgar, or politically offensive as a whole. This danger is particularly strong when a software engine is licensed. Engines define the basic characteristics of an interactive environment (such as whether objects appear in 3D), but their value as a marketing tool (“made with the *Doom* engine”) is reduced if the engine is associated by credits with inferior implementations.
- ▶ When a writer disapproves on artistic grounds with the implementation of the writer’s script. This sort of disapproval has a long tradition in Hollywood, where studios are famous for “improving” moralistic fables set in the Old West into musical films about comical buccaneers.

In general, no one has a right *not* to receive factually accurate credit absent a contract. This is true even when the credit is the author’s real name and not the pseudonym the author prefers and has used in earlier publications. As the Follett case indicates, however, a right exists not to receive *misleading* credit. A right may also exist not to receive credit when a work has been altered significantly.

But in the end, the surest way to keep your name out of the pixel limelight is the same as the surest way to keep your name in it: by agreeing to specific credit terms in a written contract that give you a right to determine whether you want your name associated with the project or not (see the sample contract clauses on page 80). And if a publisher at first refuses to accept credit terms, as many publishers will, a developer can always point out that credit should be given because it costs nothing — and then check carefully for letters arriving from a fan with many names but one address. ☛

This column provides general information and not legal advice, which requires an evaluation of individual circumstances.

These sample credit clauses are part of an agreement between a publisher and an independent contractor.

1. CREDIT

- A.** The Publisher shall give the Contractor the credit "Music Written and Performed by The Harmony Factory of Austin, Texas" (the "Credit"), and shall not give the Contractor any other credit except as explicitly provided herein.
- B.** If photographs, drawings, or other likenesses of any member rendering services in the creation of the Title are used as credits or otherwise to promote the Title, then the equivalent form of a likeness acceptable to the Contractor shall be used with equal prominence.
- C.** The Credit shall appear:
 - (1)** On an opening screen immediately after the Title's name is displayed;
 - (2)** On all other screens, advertising, boxes, other packaging, and labels on disks, CD-ROMs, and any other media in which any software programmer also receives credit; and
 - (3)** In times and places substantially equivalent to those in C.(1) and C.(2) in all derivative versions of the Title that include the Music.

2. SIZE, PROMINENCE, RELATIVE POSITION

- A.** The size and prominence of the Credit shall compare with that of the Title as follows: (1) in letters of not less than one-third in height and width, and not less than equal boldness; and (2) in screen displays with equal or greater duration and brightness. The Credit shall in any event be not less in size or prominence than that given to any software programmer.
- B.** In each recitation of credits that include credit for sound effects, the Credit hereunder shall appear first among such credits.

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- C.** Before publicly distributed or commercially reviewed, the Contractor shall be given an opportunity (1) to review all such Ports and (2) during the four weeks after receiving the last of all materials necessary to conduct such review to require by notice in the Contractor's discretion that either no credit or the following substitute credit shall be provided: "Music based on music written by The Harmony Factory of Austin, Texas."

4. GENERAL

- A.** The right not to receive Credit or other attribution shall not reduce any right the Contractor otherwise has to Payment hereunder.
- B.** The obligations hereunder to give Credit and to refrain from giving Credit or other attribution hereunder are material, and subject to the following conditions:
 - (1)** the Publisher in its discretion using all or most of the Music provided by the Contractor under this Agreement in the Title;
 - (2)** the Publisher in its discretion not using more than ____ minutes of Music created or performed by, in the aggregate, all third parties providing music used in the Title; and
 - (3)** the continuing validity without breach of the Contractor's representations and warranties in this Agreement.
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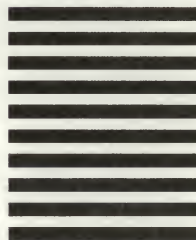
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Treasure Maps

How Great Texture Maps Can Make Ordinary Models Extraordinary

BY MARK GIAMBRUNO

A

few months ago, I attended E3 (the Electronic Entertainment Expo) and was particularly impressed with the number of new games that relied on 3D graphics.

While many touted the fact that they had been produced on pricey Silicon Graphics systems, it was interesting to note that a respectable portion of the nicest work did not come from these workstations but from desktop systems. This confirms the old saying "It's not what you've got, it's how you use it."

Two things set the best work apart: the detail and quantity of mesh in the scenes and the quality of the texture mapping. Even a beautifully sculpted model with a ho-hum map may pale next to a less detailed mesh with an excellent set of texture maps.

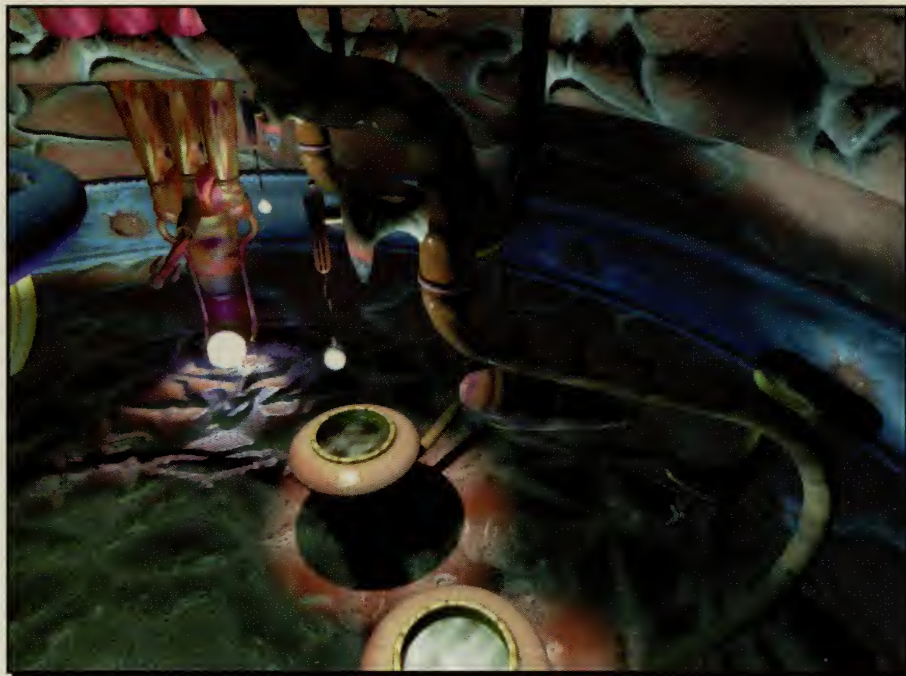
So how do you get your texture maps to go from austere to awesome? Funny you should ask.

Interview with the Texture Goddess

Laura Hainke is a senior graphic artist with Mondo Media/Mechadeus. She cut her teeth doing 2D design work for corporate presentations before becoming a 3D mapping specialist on both *Critical Path* and *The Daedalus Encounter*. It was her impressive work on these projects that earned her the inhouse nickname "Texture Goddess."

When asked to describe her method for devising and creating texture maps, she laughs and says, "It's so easy. Just paint what you want and stick it on there."

Hainke applies basic materials to the objects first, then renders the scene to get a feel for the space, lighting, and what the most important items in the shot will be. This allows her to focus on key objects and make sure the time spent mapping them is budgeted accordingly. It also allows her to determine an overall color scheme



Industrial-strength texture mapping from *The Daedalus Encounter*.

and feel for the room. She usually starts with either the walls or the most difficult objects, painting the patterns and textures on one machine while rendering on another. She reuses patterns from key pieces on other objects to save time and unify the design.

When creating textures for walls, she renders an elevation view (no perspective) of the wall and the objects attached to it, using it as the basis for a planar map. If pipes are coming out of the wall, she paints stains running down beneath them. Oil lamps get smoky smudges above them, and so forth. When she has finished a detail, she applies the map to the object and renders the scene to see how it looks in 3D.

Dirt and wear add a lot of character and realism to your mesh. Hainke tries to imagine the way a room would be used by its virtual occupants, then dirties it up accordingly. For example, she might pick out a favorite spot on a couch and apply extra stains and fraying to that cushion.

When working with spherical or cylindrical maps, Hainke sometimes turns to Positron Mesh Paint (see Texture Tools, next page), a

3D painting IPAS for Autodesk 3D Studio, as a way to outline the perimeter of a map and mark key locations on it. She likes to work on the map with her usual 2D paint programs, since Mesh Paint's toolset is not as fast or powerful. Another approach is to apply a numbered grid to the object and then use a render as a reference when painting on top of the grid.

Like other artists, Hainke likes Adobe Photoshop for its speed and control, often starting a map in Photoshop, then switching to Fractal Design's Fractal Painter to make use of its superior texturing capability. Case in point: To create a brick surface, she paints the bricks in Photoshop, making sure that the map tiles properly. Switching to Painter, she creates the brick's grittiness by adjusting the image luminance, turning shininess off, setting up a light to reveal the media's grain, and then fading it down to about 20%. She often switches back to Photoshop to apply the finishing touches, then uses the map as the basis for grayscale bump and specular maps.

Hainke enjoys using Fractal Painter's watercolor tool for staining. A small spattering brush "dipped" in burnt sienna makes good

Mark Giambruno is the creative director of Mechadeus' first two multimedia titles, *Critical Path* and *The Daedalus Encounter*. When he doesn't have his eyes glued to a monitor, he enjoys target shooting, Japanese manga and anime, scuba diving, and eating huge slabs of red meat.

mold spots on cardboard or paper. After applying the spatters, she grays out the color and enlarges the brush, then squiggles it around the perimeter of the stains to create the fuzzy white mold.

She uses specular maps to vary the shininess of a surface, adjusting it where the object has been damaged or stained. For example, a shiny leather briefcase shouldn't be shiny where it's scuffed or scratched, so she modifies the bump map and uses it as a specular map.

Hainke also relies on procedural maps, which can be very fast and powerful. Since they don't break down the way bitmapped textures can, they also can be real timesavers when dealing with an object that you get very close to in your animation. They're also convenient since they don't require mapping coordinates to be applied to an object (which can be a lifesaver with complex organic objects or objects you need to map quickly).

Laser-digitized mesh offers special challenges. For a model of a 3D character named Chavo, a physical sculpture was created by a local artist and then scanned by CyberWare in Monterey, California. The sculpture was scanned in pieces

about making the transition was the complexity of Alias' procedural texture shaders. Alias has many more settings and a steeper learning curve than 3D Studio, but this complexity is also what makes its shaders so much more flexible and powerful than their 3DS counterparts.

When mapping, Baker uses the procedural shaders rather than bitmaps whenever possible. They're particularly good for naturalistic textures, and the ability to mix and adjust multiple layers of maps gives them tremendous range. Procedural maps are



Hundreds of texture maps enhanced the realism of *Critical Path's* spaces.



A rusty custom-painted cylindrical texture map from *Critical Path's* water tower.

that had to be reassembled once the objects were digitized. Pulling and stretching the mesh during reassembly caused some loss of information in the joint areas. There were no mapping coordinates, so the model had to be separated again to work with the planar mapping scheme. Hainke used Mesh Paint to apply reference marks to the map, letting her know where details such as the facial features were.

Alias Scott Baker

Scott Baker was the lead production designer on *The Daedalus Encounter* and one of its modelers/animators. He designed and constructed the exterior of the alien ship as well as the Seti creatures and many of the interiors.

Baker uses Alias software and is a total convert after starting out with 3D Studio. Mapping-wise, he found one of the more difficult things

also resolution independent and require less memory than bitmapped textures. For example, when creating a ground texture, Baker starts with a basic dirt shader, then layers on a grass shader using a re-ramped fractal map in the transparency setting to make it spotty. Using a similar method, he was able to create a beach that transitioned smoothly from black sand to brown gravel to

grass with patches of snow.

When mapping an object that is unsuitable for procedural textures (such as a character), he applies a planar map to the object and uses CONVERT FROM SOLID TEXTURE to peel the map off the object so he can paint on it with Photoshop and Fractal Painter.

Another thing he likes about Alias is that nearly everything is animatable, including the shaders. This allows textures to move or change over time, which can sometimes allow them to substitute for mesh animation.

Scott likes the speed, power, and versatility of Photoshop, particularly its multiple alpha channel structure, which allows many layers to be created, composited, and adjusted. Like Hainke, he moves to Fractal Painter when texture, special brushes, or the wet paint functions are needed.

Texture Tools

Scanners. Scans provide a way to duplicate a texture or logo easily and can provide raw ma-



Using custom tiled texture maps yields good results with low memory requirements.

ANIMATA

terial for creating custom maps as well. However, locating noncopyrighted source material, scanning it in, and making corrections are time-consuming operations, so some artists rarely use this resource, relying on image libraries instead [see *InterActivity*, January '96 for a comprehensive listing of texture library sources]. Difficulties aside, Hainke praises the scanner as a quick way to generate ornate bump maps using a collection of art nouveau patterns as a source.

Electronic cameras. Digital photography offers many advantages of scanning without the extra step of having the film processed and made into a PhotoCD or color print. The downside is that quality cameras still cost thousands to tens of thousands of dollars, although they are available for rent at reasonable prices. Some inexpensive alternatives may work for low-res maps, but in general their video-quality output isn't good enough for use as a high-res texture map.

Image libraries. These are usually collections of royalty-free images on CD-ROM, professionally photographed and scanned. Some feature seamlessly tiling textures in addition to images of rock, wood, metal, tile, or the like. While some artists like to use these images as starting points for custom maps, others feel they're too recognizable or overused and prefer to create the textures from scratch. Still, they are an excellent



Procedural mapping was used on the alien ship in *The Daedalus Encounter*. The skid marks are actually a projection map added to a spotlight.

aid for those who don't have the time or skills to paint their own.

2D Paint programs. Photoshop is legendary and is often regarded as a must-have application, even though it lacks some of the texture tools and custom brushes that Painter features. Adding Aldus Gallery Effects, Kai's Power Tools, and other plug-ins is a good way to add more texture capabilities.

Fractal Painter has some excellent brushes and features, but is not as quick or easy to use as Photoshop. Still, its range is unequalled, making it a powerful addition to any 3D artist's toolbox. Like Photoshop, it can be augmented by plug-ins.

3D Paint programs. New to the scene are 3D paint programs, which allow the user to paint directly on 3D models. These applications in-

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Fractal Painter

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408.688.8836 FAX
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clude Amazon (from Interactive Effects) and Taarna 3D Paint (from Discreet Logic) for the SGI and Mesh Paint for 3D Studio, among others. This is a powerful new application and can solve a number of problems with precise positioning of maps, coordinate application, and most of all, the painful paint-render-repaint cycle that 2D painting demands. Beyond the capability to paint on 3D objects is Taarna's ability to apply displacement mapping, turning a pressure-sensitive tablet and stylus into a virtual chisel for chipping and deforming mesh.

Other tools. Terrazzo is a Xaos Tools product designed to create tiled textures or backgrounds from portions of other images. It works something like an electronic kaleidoscope and can produce some surprising effects.

A Wacom pressure-sensitive tablet and stylus seem to be *de rigueur* for texture mapping, al-

lowing the user to work in a natural way while increasing subtlety and control of the virtual paint immensely.

3D Revolution

In some ways, 3D is becoming more and more like desktop publishing was a few years ago, with the technology coming into everyone's grasp — and now *everyone* is using it. Setting your work apart in this increasingly competitive field will depend not only on your modeling skills, but also on the ability to create or modify textures that make your mesh sing.

Next month we'll look at a product in development that features some impressive 3D



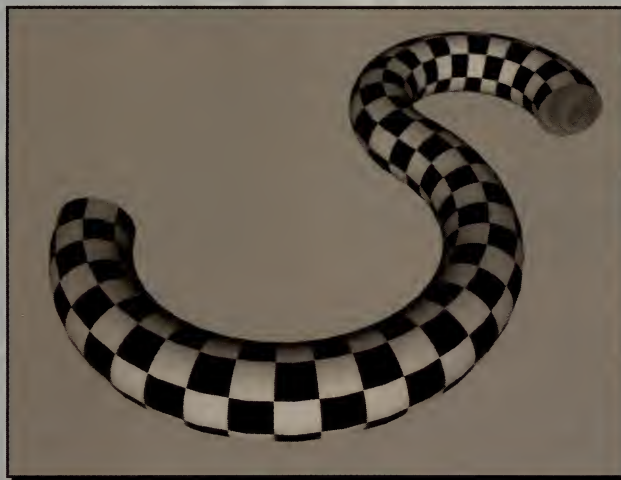
A sample of Alias' shaders at work.

graphics. I'll do my best to uncover their methods and pry out all their secrets, then spill the beans right here. (Heh heh heh. . .)

MAPPING TIPS & TRICKS

Here are some suggestions from the texture pros to help you put a better face on your work:

- ▶ Complex objects can be very difficult to map with the usual planar, cylindrical, or spherical mapping systems. If possible, apply mapping coordinates when you are skinning or lofting the object.
- ▶ Use dirt and wear to give your objects realism and history. Even a clean surface will look more realistic if it has some subtle mottling (after all, no surface is perfect). Remember to vary the specularity maps as well.
- ▶ Separating (or duplicating and offsetting) the faces on a section of an object allows you to apply custom details to that area while giving the illusion that it is part of the rest of the surface. This is particularly useful if all your map layers are used or your program doesn't have adequate decal support.
- ▶ If you can't duplicate faces and need to apply another map layer when none is available, try making a simple polygon and positioning it close to the other mesh. Apply the texture to the polygon and use an opacity map to make the unneeded portions transparent.



Applying mapping coordinates when you are skinning or lofting the object will save you time and trouble at the texture stage.

- ▶ Give yourself enough time for texture mapping. It often takes equal amounts of time to model and map objects.
- ▶ Use a texture map whenever possible rather than building geometry. It will speed up rendering and save you time in the modeling stage.
- ▶ You can make your own seamlessly tiling textures by mirroring an image horizontally, then mirroring the new image vertically. Then paint extra

details and variation in the image, but stay clear of the pixels at the edges.

- ▶ Rendering a scene from a plan or elevation view makes a good starting point for mapping. You can also use a render of a mapped object as a guide for mapping another object to ensure that the maps align properly.
- ▶ If you're modeling with small numbers of polygons, you may want to construct your model and map at a higher resolution first, then render it to create maps for the low-res version. The subtle shading added to the maps will help make them appear smoother on the low-poly model.
- ▶ Be careful that your mapping coordinates are applied relative to the front surface of the object. Otherwise the indentations in your bump map will appear to protrude instead of recede.
- ▶ If possible, use two machines when mapping with 3D Studio. Keep the paint program open in one and the 3D program running on the other. This makes it much quicker and easier to make changes in the textures and then evaluate the difference in the 3D render.
- ▶ Using fractal noise for bump and specularity mapping is a good way to turn a flat surface into a carpeted one.
- ▶ Projector lights are a good way to add decal-like textures to a procedurally mapped object or one

that has used up the available map channels.

- ▶ The images you create will vary from system to system, mostly due to the monitor on which they're viewed. Check your work on a monitor similar to the one the end user is likely to have (usually a low- to mid-range unit). Note that scenes created on Macs often appear darker when ported to PCs, probably due to differences in the gamma of the monitors.

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side byproducts of a pretty good but imperfect system of government. This fear is cousin to the fear of losing campaign funding from special-interest groups and includes the basic fear we all have of that which we don't understand. According to some, there's also an underlying fear that the institutions of which they are a part are becoming obsolete and irrelevant in a world where electronic communication practically erases national boundaries. The ignorance, of course, is what surrounds new communications technologies for most lawmakers, many of whom don't even get email.

Some have called the current wave of congressional, judicial, and law-enforcement activity a new McCarthyism. In the 1950s, numerous Americans were hauled before Congress and forced to prove they weren't communists. In addition, thousands of people were blackballed by employers out of fear that they might be so accused, either in the Senate or the House Un-American Activities Committee.

Media content of a sexual nature (often labeled pornography or the more inflammatory child pornography) has replaced communism as the expedient political motivator of the decade. Although there were, in fact, very few communists in the country during the 1950s, even fewer were willing to defend those so accused for fear of being tarred with the same brush. Child pornography is almost nonexistent, but few people want to defend it or any kind of "adult" material in this age of resurgent "family values." (In fact, the mid-1995 cover story in *Time* magazine overstated the pervasiveness of sexual material on the Net. The Rimm Study cited covered only an area of the Net that deals specifically with such subject matter, in particular "binaries" or images. Yet *Time* printed its findings as though they applied to the Net as a whole.) No wonder our lawmakers use accusations of spreading pornography to their political benefit. This time, however, the first victims of the witch-hunt are developers of interactive content and service providers who offer access to it, soon to be followed by those who contribute to related industries.

In the words of cyberactivist John Perry Barlow, cofounder of the Electronic Frontier Foundation (EFF), "When the principal article of commerce (new media content) looks so much like speech as to be indistinguishable from it, you'd better care about freedom of expression. In a global network environment, there's no difference between freedom of expression and freedom of enterprise."

The two primary issues are freedom and privacy. These fundamental concepts were significant enough to the founders of this country that they were willing to fight and die for them. A free and private cyberspace may not seem worth that

price, but those of us who have never lived without the protections of the Constitution and Bill of Rights may soon learn firsthand how important they are.

It's ironic that the Bill of Rights, a document written 220 years ago to support a stronger social fabric, has become the battlefield in which art and commerce are about to square off against the people elected to protect these very rights. So boot up your next-generation game platform and choose a side. Will you join the civil libertarians and those who want to maintain or expand freedoms and privacy? Or perhaps you'd rather play the role of government and law enforcement agents challenged by the decentralizing influence of new media pipelines.

Seriously, though, my intention is not to convert readers to my way of thinking (though I don't wish to hide my leanings), but rather to offer an introduction to the facts about some key legislative and judicial issues that may have a serious impact on our future. I hope this will help you determine for yourself where you stand. It is also my hope that you become motivated to exercise your right to free speech, whatever your view, and take an active role in the debate with lawmakers, business associates, friends, and family members.

Challenges to Free Speech

In June 1995, the U.S. Senate passed a telecommunications reform bill with an amendment known initially as The Communications Decency Act (CDA), then as the Exon/Coats Amendment after sponsors James Exon (D-Nebraska) and Dan Coats (R-Indiana). The bill passed 84 to 16 with less than 45 minutes of debate — an unusually brief discussion for a bill that will have repercussions for generations. The House version passed in July, and by the time you read this the final drafts may well have been signed into law.

While the reforms specified in the main body of the bill are worthy by and large, the provisions of the Exon/Coats Amendment constitute a severe threat to freedom of expression in new media. The following points are drawn from an analysis of the Senate legislation by the Center for Democracy & Technology. In the Center's view, the bill:

- ▶ Bans "indecent" material from most parts of the Internet without defining "indecent."
- ▶ Does not identify a means of regulation or enforcement.
- ▶ Makes that which is protected in print media subject to criminal sanction in cyberspace.
- ▶ Criminalizes annoying messages using harsh, not obscene, language.
- ▶ Gives the Federal Communications Commis-

sion (FCC) jurisdiction over content and technical standards on the Net.

- ▶ Makes service providers responsible for content posted or transmitted by users unless they can demonstrate that their policy is not to regulate such content.
- ▶ Specifies penalties of up to \$100,000 and up to two years in prison for convicted transgressors of the law.

In simple terms, Exon/Coats would diminish your First Amendment rights in law, drawing a sharp distinction between print and interactive media. For example, though it would be legal to sell a sexually explicit magazine or painting, you wouldn't be able to deliver identical information over the Internet. Laws controlling "obscene" material already exist, and they apply in cyberspace as anywhere else. Enforcement remains a challenge in any case, but CDA would leave any business that allows users to post their own material open to charges that they are responsible for the content that flows through their service, and thus violating the law if anything "indecent" crops up. Undoubtedly many legitimate businesses would deem this an unacceptable risk and throw in the towel, not to mention the decreased latitude for open communication among otherwise law-abiding citizens.

Giving the FCC jurisdiction over the Net would put them in charge of technical standards for all current and future Internet services such as the World Wide Web, electronic mail, and Usenet newsgroups. Certainly this is counter to the nature of the Net. If the history of broadcast media is any indicator, such an FCC role would stifle the Internet's growth and cast a continual chill over all speech in interactive media.

In a recent TV interview, Speaker of the House Newt Gingrich showed rare solidarity with his more liberal colleagues when he observed that Exon/Coats "is clearly a violation of free speech, and it's a violation of the right of adults to communicate with each other. I don't agree with it, and I don't think it is a serious way to discuss a serious issue, which is, how do you maintain the right of free speech for adults while also protecting children in a medium that is available to both?"

Which brings us to another one of those sticky questions: Is it the job of government to determine what is appropriate for our children? Thanks, Senator, but I'll decide how and when to introduce my kids to sexuality and how to explain the pervasiveness of ignorance, hatred, and violence in the world. Meanwhile, if you were as concerned about getting our kids a decent education and twentieth-century health care as you are about pornography on the Net, we would all be better off.

The real challenge is to create a regulatory model for interactive media that does not un-

determine the First Amendment, the Net, or the ability of U.S. citizens to communicate with one another and the rest of the world.

It's obvious that regulators don't understand the thing they're trying to regulate, so it isn't surprising that the best solutions currently come from the private sector. Products like SurfWatch (<http://www.surfwatch.com>), Internet Filter by J.D. Kofinoff Software (<http://www.xmission.com/~seer/jdksoftware/>), NetNanny, CyberSitter, and The Internet Bouncer are finding their way into the marketplace. They offer parents a variety of ways to control what the kids can access and when.

With luck and more involvement on the part of the new media community, we might be able to save the constitutional rights of adults while shielding youngsters from information we, as individuals, deem inappropriate. Who knows? Maybe we'll even evolve beyond our fear of healthy sexuality (a guy's got to hope).

Indeed, freedom of digital expression bears on the very purpose of some of our most cherished institutions. In the near future, the role of national boundaries and governments will become as questionable as the role of international copyright law is today.

Already, Barlow points out, copyright law is being used to suppress freedom of speech. In an internationally publicized case, the operator of an anonymous server in Finland was sued by the Church of Scientology with the aim of shutting the server down entirely. "They wanted to do this because [the server] was used to post material [critical of Scientology that] they found offensive. The only way they found to do this was to invoke international copyright law," Barlow foresees a "legal bloodbath" as the ease of distributing information globally makes copyright law less and less enforceable, and as the organizations rendered obsolete by digital communication scramble to preserve it.

Challenges to the Internet Community

Moving to the judicial system, you'll find we're in a pickle there, too. In a landmark case currently under appeal, Robert Thomas, the operator of an adult-oriented BBS in California, is doing time in a Tennessee prison. Law enforcement officials in Tennessee downloaded images to their local office from Thomas' server in California. Does having an "offensive" file on your server constitute distribution? Or does the act of downloading it? (Or was the downloader in this case engaged in entrapment?) If the offensiveness of the material is to be judged by "community standards," should it be the community of Tennessee's Bible belt, liberal Northern California, or cyberspace as a whole?

Thousands of BBSs operate in the United States alone, many of them small businesses run by responsible entrepreneurs who offer a welcome service to their respective online communities. Most are not sexually oriented — but few

have the resources, nor any good reason, to police their clientele and regulate the flow of information to and from their servers. If the Thomas conviction stands, this industry falls. Among the wreckage will be a lot of businesspeople with no connection to pornography other than the fact that they, too, use the Net.

Furthermore, the Net doesn't recognize national borders. Materials transported across it may originate anywhere on Earth. If it's lawful to imprison somebody in California for an infraction in Tennessee, why not someone from Madagascar or Japan? Are we to become as well known for repression in the coming century as we were for freedom in the last?

Steve Russell, who teaches constitutional law at the University of Texas, puts this into perspective. "With the advent of the printing press," he observes, "free speech and a free press became joined at the hip. Where electronic publishing will fit within the available legal paradigms, or whether a new one will be created, will define the dissemination of ideas from the 21st Century until the next technological revolution."

At the very least we need a legal paradigm that acknowledges the similarities between cyberspace and the realworld metaphors often applied to it. Kids aren't allowed into adult book stores, and they probably shouldn't be allowed into adult BBSs either. But when it comes to enforcing moral codes of a community, government must recognize that cyberspace is a community of its own and defer to its standards of appropriateness.

Challenges to Privacy

When you consider the possibility of secure, private transactions on the Net, you get a sense of just how confused and frustrated our law enforcement agencies are. To do business online, it's essential to assure the security and privacy of communications just as you would in the physical world. Yet the FBI and NSA are trying to convince the legislative and judicial branches that new media are somehow less entitled to constitutional protection than traditional media.

How else would you explain the case of Phil Zimmerman, the soft-spoken software engineer who designed the encryption program Pretty Good Privacy (PGP) and made it available for free over the Internet? What he had in mind was protecting privacy for individuals and organizations on the Net. What he got was a notice that he was being investigated for possible violation of laws concerning arms export because the program was available in foreign countries. Why does the U.S. government classify encryption software as a "munition" and try to prevent its own citizens from having that which is available virtually everywhere else in the world? My guess is that familiar spectre: Fear.

John Bagby is a longstanding member of the Net community and frequent user of PGP. He isn't interested in encryption because he has

something to hide, but like most of us, he does have privacy to protect. "I began to use PGP to protect information assets," he states, "much as a safe might be used to protect physical assets."

"As technology evolves, so must tools for preserving constitutionally ensured liberties," Bagby continues. "PGP is an elegant remedy to the growing encroachment on freedom of speech by policy makers intent on 'protection through control.' Pattern-recognition engines in the service of government factions engaged in a cultural war against U.S. citizens, direct-marketing databases in the service of prying eyes in search of the ultimate targeted demographic — both are

WHERE DO WE GO FROM HERE?

What can you do to take part in the debate about freedom of electronic expression? Some suggestions:

- Write your state and federal legislators to tell them where you stand regarding freedom of expression in new media.
- Urge legislators to hold public hearings to identify problems and possible solutions.
- Express your views in letters to publications that cover communication and media technologies as well as local news media.
- Generate online discussion about the issues raised here and others that concern you.
- Organize a grassroots effort online and in your local community.
- Ask online service providers about their position and enlist their help.
- Investigate the organizations and resources listed below to become more familiar with the issues and to learn what actions are being taken. Join those whose goals and methods you support.

If you aren't a U.S. citizen, don't let that stop you. There's no reason you can't contact U.S. elected officials and express your concern over the international effects of the Communications Decency Act. International concern about U.S. domestic laws is sufficiently rare that you may well get their attention.

very real threats to basic rights of individual liberty, privacy, and pursuit of happiness. PGP levels the playing field, allowing individuals to preserve liberties and protect against [unjust control]."

There's another use for PGP that few people mention: verifiable identification. This tool not only keeps communications private, but it also allows receiving parties to verify that you were the sender of a given message. Online communication leaves ample room for such abuses as impersonation. A utility that prevents such abuses will be essential to business in cyberspace — if it's ever allowed to develop.

It's hard to imagine how denying the government access to everyone's email threatens national security. Is copying software onto a remote hard drive equivalent to exporting it? Is it appropriate to deter those who might follow by intimidating those who got there first? It will be

a sad day when the mightiest democratic republic is reduced to a police state because those in power didn't understand the ramifications of their decisions and those who did understand failed to raise their voices.

As of this writing, Zimmerman hasn't been indicted yet. It's possible that he will be, and either way he's likely to incur substantial legal costs. (For information on the case contact Phil Dubois, attorney, at 303.544.9240 or <http://www.netresponse/zldf>.)

More recently, the FBI was assisted by the management of America Online (AOL) in identifying and prosecuting individuals allegedly using the service to transmit sexually oriented images involving children. The individuals were arrested, their computers were seized, and as of this writing they await trial. If found guilty, they will face the same serious penalties as if they had used the U.S. Postal Service to commit the same felonies. AOL, in this case, is simply carrying out

its published terms of service, and the U.S. Government is enforcing laws already on the books. This is as clear a demonstration as anyone could ask for. We do not need more laws restricting communication. What we need is consistent, fair enforcement of those we already have.

Efforts to expand the FBI's and NSA's authority to tap phone lines as well as new legislation, case law, and challenges appear every week. It's virtually impossible to keep up with it all, even with the Web at your fingertips. The best you can do is determine which issues are of greatest concern to you and follow a course of action that supports the results you desire. The key word, of course, is action. No one will protect your rights for you. So pick up the phone, get on the Net, mail a letter, send a fax, and vote for those who represent your viewpoints. Each of us had better speak up while we still can. Otherwise before long it may be game over in cyberspace and a dismal future for our way of life. ☸

CYBERACTIVIST RESOURCES

President Bill Clinton, White House, Washington, DC 20500; vox 202.456.1111; fax 202.456.2461; Internet president@whitehouse.gov, <http://www.whitehouse.gov>.

Vice President Al Gore, White House, Washington, DC 20500; vox 202.456.1111; fax 202.456.2461; Internet vice.president@whitehouse.gov, <http://www.whitehouse.gov>.

Senator [name, state], U.S. Senate, Washington, DC 20510; vox 202.224.3121; Internet <http://www.senate.gov>.

Well over half of the members of the U.S. Senate have published Internet email addresses. A list is available via the Senate Gopher server (<gopher://ftp.senate.gov>) and the Senate homepage on the World Wide Web.

Representative [name, state], U.S. House of Representatives, Washington, DC 20510; vox 202.224.3121; Internet <http://www.house.gov>.

Many members of the House of Representatives have published email addresses. A list can be found via the House Gopher server (<gopher://gopher.house.gov>) and House homepage on the Web.

For up-to-date information about the **Communications Decency Act**, surf to <http://www.zilker.net/senate/s314.html>. Various sites associated with the federal government are accessible via <http://www.zilker.net/fed-gov.html>.

The Thomas Web site (<http://thomas.loc.gov>) contains the full text of the Congressional record and the full text of all House and Senate bills.

The Library of Congress Information System (LOCIS) allows you to search bills and their status, including current cosponsors and committee actions (telnet://locis.loc.gov:23). "Access hours" may prevent you from using it late at night or on weekends.

American Civil Liberties Union (ACLU), 132 W. 43 St., New York, NY 10036; vox 212.944.9800 x614; fax 212.354.5290; Internet infoaclu@aclu.org, <gopher://aclu.org:6601/1/issues/cyberspace/state>, <ftp://ftp.pipeline.com/aclu>.

Voter's Telecommunications Watch (VTW), 233 Court St. Ste. 2, Brooklyn, NY 11201; vox 718.596.2851; Internet vtw@vtw.org, <http://www.vtw.org>.

VTW monitors civil liberties issues with respect to telecommunications legislation and federal policy.

Center for Democracy & Technology (CDT), 1001 G St. N.W., Ste. 700 E., Washington, DC 20001; vox 202.637.9800; fax 202.637.0968; Internet info@cdt.org, <http://www.cdt.org/>, <ftp://ftp.cdt.org/pub/cdt/>.

Electronic Frontier Foundation (EFF), Box 170190, San Francisco, CA 94117; vox 415.668.7171; fax 415.668.7007; BBS 202.861.1223 (16.8k ZyXEL), 202.861.1224 (14.4k V.32bis); Internet ask@eff.org, <http://www.eff.org>.

Computer Professionals for Social Responsibility (CPSR), Box 717, Palo Alto, CA 94302; vox 415.322.3778; fax 415.322.4748; Internet cpsr@cpsr.org, <http://snyside.sunnyside.com/home/>.

CPSR was founded in 1981 out of concern about the use of computers in nuclear weapons systems, but now strives "to provide the public and policymakers with realistic assessments of the power, promise, and problems of information technology."

Electronic Privacy Information Center (EPIC), 666 Pennsylvania Ave. S.E., Ste. 301, Washington, DC 20003; vox 202.544.9240; fax 202.547.5482; Internet epic@cpsr.org, <http://www.epic.org>.

EPIC was established in 1994 to focus public attention on civil liberties issues relating to the National Information Infrastructure such as the Clipper Chip, the Digital Telephony proposal, medical record privacy, national identification systems, and the sale of consumer data.

Relevant Usenet newsgroups include alt.activism, alt.politics.datahighway, alt.privacy, alt.privacy.clipper, alt.security.pgp, alt.security.ripem, alt.society.civil-liberty, alt.2600, comp.risks, comp.society.privacy, misc.legal, sci.crypt, talk.politics.crypto. ☸

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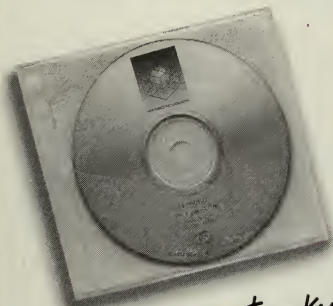
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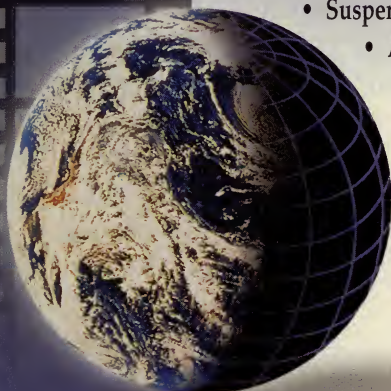
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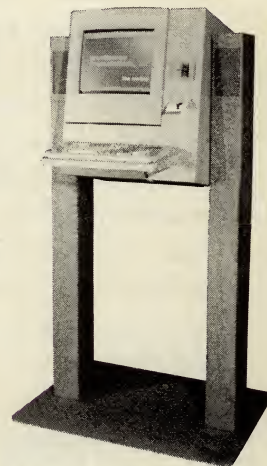
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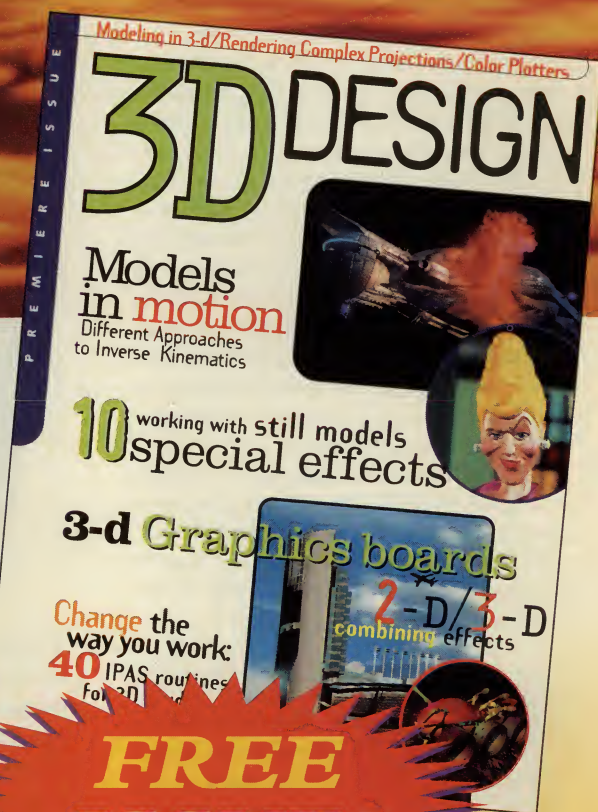
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Fear & Ignorance

IN CYBERSPACE

BY ROBERT B. GELMAN

T

here's a spine-tingling new interactive game now being played, with the most realistic first-person POV you'll ever experience. And, like it or not, you *will* experience

it. It could be the most exciting thing yet to hit the new media marketplace. It also could spell the end of your budding career.

Here's the premise: You're a struggling producer of interactive titles with a major distribution deal on which the ink has yet to dry. Your job is to create gripping new media content for CD-ROM or online delivery. To be successful, your product must have great game design, imagery, sound, programming, and more.

Once you've maneuvered your way through the production level and you're on to mastering, you've got to switch gears and begin a parallel process with entirely different rules called marketing. In this section of the game, you're required to time news releases, ad campaigns, and cover stories in the press to dovetail with your tenuous product development cycle. This level of play gets tougher every time you re-open the game, with desperate enemies (called competitors) coming at you from every direction. It's a tooth-and-nail battle for retail shelf space (or online screen space), though you may opt for a co-op ad or bundling deal.

But even if you survive this level, you're still a long way from the goal of financial success. Before you ever get to the cash register (the only place in this game where points are scored), you've got to pass through the most difficult peril of all: government regulation.



Robert Gelman is president of BG & Associates, a consulting firm specializing in the development, production, and marketing of interactive entertainment. His clients

have included film & TV studios, record labels, and software developers. Among his event production credits are the CyberArts International Conferences, the Digital Art Be-In, and the Burning Man Festival.



If this actually were a game rather than cold, hard reality, it would rank as one of the most challenging ever devised. The technology at your disposal often works against your purposes. Furthermore, content creators are just beginning to understand the issues that must be resolved to make products that are more than shovelware. The better platforms have achieved precious little consumer penetration. Even the high rollers are engaged in nitty-gritty competitive skirmishes for relatively thin slices of a decidedly small pie.

If these obstacles aren't enough to keep passionate, articulate, creative folks like yourself from forging ahead into the uncharted interactive future, leave it to the federal government

to place the ultimate tripwire at your feet. In the past months the U.S. Congress has undertaken to make life more difficult, even critically perilous, for producers of new media (unless you like the idea of working from prison). It's going to get harder before it gets easier, if it ever does get easier, thanks to some thoughtless actions by our elected representatives attempting to deal with fear and ignorance in the time-honored manner: through censorship and punishment.

Sex, Lies, and Legislation

The fear, apparently, is of losing the votes needed for re-election, one of the major down-

Continued on Page 88

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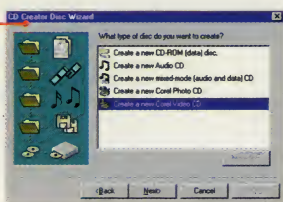
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Open CorelDRAW™ 6 or other Windows® 95 OLE 2.0 graphics applications within Corel CD Creator 2 to edit images for jewel case inserts.



The jewel case editor allows the user to design and print to the surface of the CD with a supported disc printer.

Corel PCD Creator allows digital photographers to create Photo CD Image Pac discs.



Audio can be edited using the new 32-bit Corel SOUND application.



IDEAL FOR:

- Multimedia presentations
- CD-ROM publishing
- Interactive training
- Archiving data
- Distributing data
- Mixing and editing music
- Reference material
- Distributing product catalogs

EASY TO USE!

- Extensive Disc Wizard
- Drag and drop information into Corel CD Creator 2
- Context-sensitive Help
- System tests validate hardware requirements
- Support for CD Plus™ (Enhanced CD)

APPLICATIONS INCLUDED:

Corel VCD Creator - Select videos and stills from various sources, describe the menuing structure, and produce a video CD that can be played on any video CD player.

Corel PCD Creator - Display and select PCD images that are then written to a CD.

Corel CD Duplicator - Allows you to easily duplicate CDs.

Corel SOUND - A 32-bit audio editor that includes many special effects.

Corel Session Selector - Enables you to select any session of a multisession disc.

XingMPEG™ Software - Includes XingMPEG Encoder™ and XingMPEG Player™ software for video CD. Encoding boards are not necessary, but can be used if available.



\$329.99*

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Document # 1015